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As the Editor Views the News

LAST week industry moved its heavy guns into position to oppose the Black 30-hour bill. In spite of the fact the Roosevelt administration is not actively supporting this proposal, a considerable number of congressmen seem to be sympathetic to it. One representative, from a northeastern industrial state, had the effrontery to declare last Thursday that he had never heard anyone say that a blanket 30-hour week would tend to lower the standard of living. Like many others in Washington, he has become so imbued with an anti-industry complex that he is incapable of considering proposed legislation affecting business impartially.

• • •

Must Battle Prejudice

Consequently, Walter S. Tower, James A. Emery and others who have been appearing before the senate judiciary committee in opposition to the short work-week bill (p. 14), are confronting not only the power of the A. F. of L. labor bloc but also the prejudice of a strong body of anti-industrialists. Many in this latter group are convinced that industry has been engaged in a concerted effort to knife the new deal at every turn. They charge openly that industry has been "on strike" for 18 months. The public interest demands that these misinformed legislators be enlightened, and the major responsibility for their education lies at industry's door.

• • •

Labor Tension Relieved

Just how much the present slight relapse in steelworks activity (p. 65) can be traced to uncertainty attending the pending gold decision and how much to market conditions is hard to determine. Code provisions undoubtedly constitute an important factor. The underlying strength of the automobile situation is demonstrated by the comparative figures on motor car sales to consumers and dealers (p. 23), which show a much heavier retail demand now than a year ago and relatively smaller stocks in dealers' hands. The possibility of serious labor trouble, which complicated the outlook in steel and automobiles a few weeks ago, now seems more remote (p. 21), due to confusion of policy within the ranks of professional unions, and to the apparent disposition among automobile partsmakers to grant minor concessions in order to snuff out incipient disturbances.

• • •

Continue the Good Work!

The eighth annual meeting of the Metallurgical Advisory board to the Carnegie Institute of Technology, held Feb. 8 at Carnegie Union (p. 56), might easily have been considered the finale of the board's activities. The original 5-year program and the supplementary 3-year studies had been completed. Fortunately, the members of the board were reluctant to sing the swan song on its activities. They will attempt to enable it to continue to function. The annual get-together meetings will be continued. The tangible results of the work in terms of improvement in the quality of open-hearth steel and in reduction in the cost of producing it are so important that the industry may well consider the advisability of authorizing and supporting further activities of the board.

• • •

The "How" Is Important

That skill in fabrication is important in the successful application of stainless steel is emphasized (p. 44) by the president of a Wisconsin company which has constructed more than 900 sizes and types of stainless steel equipment for the food and dairy industries. Often when a manufacturer encounters difficulties in fabricating stainless, he blames the material, whereas in reality the fault lies in his own lack of knowledge as to how to handle the steel properly. Fortunately, alloy steel producers constantly are giving more and more attention to this problem, the solution of which is essential to successful market development. . . . Proper procedure likewise is the key to success in the A. C. arc welding of Class I pressure vessels (p. 30) and in the preparation of machine elements (p. 34) for metal spray coating.

E. L. Shaner

Tower Hits 30-Hour Bill as Threat to Labor's Earnings

WALTER S. TOWER, secretary of the American Iron and Steel institute, New York, made a strong attack on the Black-Connery 30-hour week bill in an appearance Friday before a subcommittee of the senate judiciary committee in Washington.

The steel industry is opposed to a 30-hour week, he declared, "because practically every consideration of the effects of such legislation, if it were enacted, is an argument against it."

No sound argument can be advanced in favor of such a short workweek, Mr. Tower maintained, and schedules in the steel industry could not be drastically reduced by legislation without causing most serious dislocations affecting both employes and employers.

1934 Average 29.5 Hours

Mr. Tower said further:

It took 30 years, from 1900 to 1930, to reduce working hours in industry generally by 13 per cent under normal processes of industrial evolution.

During 1934, with the steel operating rate averaging 37 per cent and the work week limited to 40 hours by the Steel code, wage-earning employes in steel actually worked an average of only 29.5 hours per week, which at the average rate to earnings per hour meant an average weekly pay envelope of $18.53.

The best actual average work week that could be reached under a 30-hour maximum week probably would be not more than 28 hours, which if in effect during 1934 would have reduced the average weekly pay envelope of wage-earning employes in the industry to $17.58.

In other words, without materially increased rates of pay per hour, the effect of a 30-hour week would be to freeze earnings of all such wage earning employes at or below a bare subsistence level.

Direct labor cost would not only represent an increased burden on industry, resulting from a shorter work week, but many new inexperienced employes who would have to be injected into working forces would also lower the average efficiency of all.

Shorter hours also would entail less efficient plant utilization, all of which would mean a decrease in output per worker and an increase in production costs per unit. The result would either be ultimately higher prices for the consumer or greater losses for the producer.

All industries would be affected alike, and when increased costs had gone around the circle, the real income of labor, measured by purchasing power, would certainly be no more than before. Decreased purchasing power would retard business and slow down recovery.

The international trade situation is also worth considering. Our workmen are in competition with those of foreign countries where wage earners work 60 hours or more per week and rates of pay per hour are reported to be only one-half to one-tenth of the rates paid in the United States.

Walter S. Tower

. . . a boomerang on labor, he termed the Black-Connery 30-hour bills

Still further reduction in hours and increase in rates in this country would give foreign producers of steel just so much more advantage in our local markets and still further reduce our possibilities of competition in foreign markets.

Also appearing before the senate subcommittee, James A. Emery, general counsel for the National Association of Manufacturers, stripped the 30-hour bill to the bones, exposing the extreme hardship that it would wreak upon industry.

The bill, said Mr. Emery, outlaws from commerce every commodity not produced under the conditions congress prescribes, makes a criminal of every person who delivers or ships goods not produced in conformity with the mandate of congress, demolishes the entire structure of NRA without substituting new machinery, violently destroys every voluntary agreement made by the President and upsets all code structures and bargaining agreements made in the past two years.

The rigid six-hour, five-day week proposed by the Black bill is to be enforced, as Mr. Emery analyzed the bill:

1. By prohibiting the shipment, transportation or delivery in interstate or foreign commerce of any article or commodity produced in any mine, quarry, mill, cannery, workshop or manufacturing establishment in the United States in which anyone present, except officers and their clerical assistants, are permitted to work more than five days of six hours each during any week.

2. Every existing or future code or agreement under the NIRA is compulsorily amended to include the same labor standards, thus bringing in every form of coded business or any operating under voluntary agreements with the President.

3. The United States is prohibited from purchasing, through any department or agency, from any business operating contrary to the provisions of the bill, and every federal contractor will be required to stipulate that he will not buy from such a business.

4. Every government credit agency is prohibited from making or renewing loans to one class of employers. That is, those engaged in mining, quarrying or manufacturing, if they employ anyone contrary to the labor standards prescribed. If such employers apply for a loan, they must agree, as long as their debt exists, to maintain the working conditions prescribed and, in event of a single violation, the principal of the loan becomes immediately payable.

Labor Leaders Quarrel

Meanwhile, there were important developments in Washington last week on another phase of the labor front.

Within the American Federation of Labor the breach between conservative and aggressive leaders widened (see p. 21), while the civil war in the Amalgamated Association of Iron, Steel and Tin Workers grew more sanguinary, as both Michael F. Tighe, veteran president, and William J. Spang, expelled "rank and file" leader, pleaded their cases before a Federation subcommittee headed by John Lewis, United Mine Worker president.

And at Cleveland the vertical union which the federation is trying to rear in the automobile industry trotted out a trial horse in the form of demands upon the Fisher Body subsidiary of General Motors Corp.

Among other things, the United Auto Workers federal union at Fisher Body is demanding an annual minimum wage of $1560 for unskilled and $1820 for skilled workers; a 30-hour week with time and

one half for Saturday and double time for Sundays and holidays; a $30 weekly minimum for unskilled and $35 weekly for skilled labor; seniority rights and preference for older workers in light work.

Institute

SPRING meeting of the American Iron and Steel institute will be held in New York, Thursday, May 23, the Institute officially announced last week. Beginning with 1932, the fall meeting of the Institute has been omitted. The technical program for the spring meeting is not completed.

GREGG MADE A DIRECTOR

Robert Gregg, who on Feb. 1 left the presidency of the Tennessee Coal,

Robert Gregg

Iron & Railroad Co. to become vice president in charge of sales of the United States Steel Corp. in New York, has been elected a director of the Institute to succeed Charles L. Wood. Thus, both as vice president of the Steel corporation and as director of the Institute Mr. Gregg is the successor to Mr. Wood.

George Gordon Crawford, former president of the Jones & Laughlin Steel Corp., also has resigned as a director of the Institute.

MILL EXTRAS AGAIN DELAYED

Imposition of mill quantity extras on steel plates and shapes has again been postponed by the Institute, this time to June 1 when extras become effective on sales for shipment beginning July 1. These extras were to have been effective March 1 on shipments on and after April. Comparable mill quantity extras on bars were adopted last fall.

NRA

A SENATE investigation of NRA appeared Friday to have been definitely sidetracked when a resolution by Senator McCarran, Democrat of Nevada, was referred to the senate finance committee. It is generally believed in Washington that the resolution will be pigeonholed there.

CNRA last week:

Gave conditional approval to budget of secondary steel products warehousing trade, for $7500.

Received a modified budget for the alloy casting industry of $27,303 for the year ended June 16.

Approved a supplemental code for the mine car manufacturing subdivision of the machinery and allied products industry, fixing a 40-cent hourly minimum wage and a 40-hour maximum work-week.

WHAT LABOR WANTS FOR NRA

In an exchange of letters between William Green, president of the American Federation of Labor, and President Roosevelt, designed to smooth down ruffled fur following the sharp interchange precipitated by the President's extension of the automobile code, Mr. Green makes the following recommendations concerning NRA:

That its administration be kept a governmental function; that section 7a be retained; that provisions for regulation of child labor and establishment of minimum rates of pay and maximum hours of work be retained; that labor have equal representation with industry in the administration of NRA and be accorded representation on all code authorities.

NEW CODE AUTHORITIES

Sprocket chain industry—C. W. Spalding, Link-Belt Co., Indianapolis; Brinton Wolsor, Chain Belt Co., Milwaukee; C. R. Heller, Jeffrey Mfg. Co., Columbus, O.; Jervis B. Webb, Jervis B. Webb Co., Detroit; and R. R. Fauntleroy, Moline Malleable Iron Co., St. Charles, Ill.

Horseshoe and allied products manufacturing industry—C. H. French, Fowler & Union Horse Nail Co., Buffalo, to succeed Staunton Williams, resigned.

CIt was said at the White House late Friday that a message on NRA would go to congress "very soon."

Merger

BEFORE a federal district judge in Cleveland, Tuesday, the department of justice through District Attorney Freed is to argue for a temporary injunction to prevent consummation of the proposed merger of the Republic Steel Corp. and the Corrigan, McKinney Steel Co.

On Feb. 7 the department filed suit attacking the merger on the ground it violates the antitrust provisions of the Clayton act. At the same time the department of justice charged a violation of section 8 of the Clayton act through directorships in

They Attack Steel Merger

Above are the two men who drafted and filed the suits to prevent the merger of the Republic Steel Corp. and Corrigan, McKinney Steel Co. and to unlock alleged interlocking directorates of seven Middle West men in ten iron and steel companies. At the left is Walter L. Rice, special assistant in the department of justice, Washington; at the right is Emerich B. Freed, district attorney at Cleveland. Acme photo

ten iron and steel companies held by seven Cleveland men.

Attorneys for the steel companies were working last week on answers.

(*See Page* 21)

Structural Code

D M. NELSON, Chicago mail order house executive who is assistant to S. Clay Williams, chairman of the national industrial recovery board, has been directed to hold conferences, probably beginning this week, looking to a final determination on the structural fabricators code which has been in suspension since last July, because the industry refused to accept a code with control of election of steel in the closed shop construction industry code.

This attempt to solve the structural code difficulty follows months of negotiations between NRA, officials of the American Institute of Steel Construction Inc., and labor leaders. it is believed that Mr. Nelson will try to bridge the gap over the present code rather than institute hearings for a new one.

Meetings

AMERICAN Foundrymen's association, Chicago, has selected Toronto, Ont., largest foundry center in Canada, as the place for its 1935 convention, Aug. 19-23. This meeting, to be held without an exhibit, will be patterned after the successful meeting held in Chicago in 1927.

Monday, first day of the convention, will be devoted to committee meetings and registrations. Technical sessions are scheduled from Tuesday morning to Friday noon, there being fewer papers and more opportunities for informal group meetings and plant inspection. Closing of the convention Friday noon will coincide with opening of the Canadian National exposition.

SPONSOR CASTING MEETING

Chicago section of the American Foundrymen's association, the Western Society of Engineers, and Chicago section of the American Society of Mechanical Engineers are sponsoring a joint meeting March 18 in the Engineering building, Chicago, on "Engineering Uses of Modern Cast Metals."

Advances in gray iron will be discussed by H. Bornstein, chief chemist and metallurgist, Deere & Co., Moline, Ill. Progress in malleable iron will be discussed by D. P. Forbes, president and general manager, Gunite Foundries Corp., Rockford, Ill. Developments in the cast steel field will be told by A. N. Connarroe, metallurgist, National Malleable & Steel Castings Co., Melrose Park, Ill.

An exhibit showing developments in foundry technique, physical properties and special applications of cast ferrous metals of special interest to designing engineers, will be held in conjunction witht the meeting.

Transportation

EUROPEAN trend toward lightweight stainless steel railroad cars such as those of the Burlington "Zephyr" and the Boston & Maine-Maine Central "Flying Yankee" is disclosed by an order for 15 single unit cars by the Northern Railways of Italy and an order for 30 two-car trains by the French Railways, to be built in Italy and France under license from the Edward G. Budd Mfg. Co., Philadelphia. The cost of these cars will total $3,000,000.

¶Recently 380 tons of steel plates were wanted by the Los Angeles Shipbuilding & Dry Dock Corp. for repairing the tanker AUSTRALIA. A Pittsburgh mill had the steel in San Pedro exactly 14 days after the order was telegraphed.

Labor

EARNINGS by employes of the steel industry have been increased at the rate of $100,000,000 annually from the basis in effect before the industry increased pay and went under its code. An analysis of steel wage and hour trends by NRA reveals this fact, figures and comparisons being shown in the accompanying table.

Provisions for an 8-hour day and 40-hour week, averaged over a 6-month period, with wages increased under the code, have maintained earnings and employment in periods of declining production and shared with workers benefits of rising production and higher prices.

Code statistics show that in September, 1934, at the lowest production level, since the code, there were 43,683 more employes than in June, 1933, the last month under pre-code conditions. NRA estimates the 381,828 employes then working earned $8,000,000 more than they would have received on the June, 1933, basis. In December, 1934, payrolls are estimated to be $9,000,000 higher than the June, 1933, basis would have yielded.

RETIREMENT PAY IS 6¼%

Pullman-Standard Car & Mfg. Co., Chicago, has adopted the following

Wage Payment Increased $100,000,000 Annually Under Steel Code of NRA

All Employes, Including Salaried Workers

	Pre-Code June, 1933	Nov., '33	May, '34	June, '34	Sept., '34	Oct., '34	Nov., '34	Dec., '34
Total number of employes	338,146	399,569	449,362	455,966	381,828	381,431	381,663	386,345
Increase over June, 1933	.....	61,423	111,216	117,820	43,682	43,285	43,517	48,199
Total payroll wages and salaries	$30,560,761	$32,671,986	$51,895,931	$49,466,644	$29,142,892	$32,723,909	$32,937,099	$35,362,732
Index (June—100)	100	107	169.8	161.8	95.4	107.1	107.8	115.7
Total man hours worked	57,555,369	49,589,487	73,780,607	70,774,145	39,473,407	45,284,262	45,165,828	48,529,687
Index (June—100)	100	86.1	128.2	123	68.6	78.6	78.5	84.3
Operating ingot capacity, per cent	45.96	26.5	56.8	53	22.9	24.8	28.2	35.5

Calculated Effect of Code on Payroll

*Theoretical total payroll if there had been no code	$30,560,000	$26,281,000	$39,178,000	$37,588,800	$20,964,160	$24,020,160	$23,989,600	$25,762,000
†Theoretical payroll increase due to code	.....	$6,390,000	$12,717,000	$11,877,600	$8,176,700	$8,703,749	$8,947,500	$9,600,700

Hourly, Piecework and Tonnage Workers

Total number of employes	305,239	362,206	409,698	415,547	343,064	342,771	343,219	347,872
Index (June—100)	100	119	134.2	136.1	112.4	112.3	112.4	114.0
Average hours per week	39.4	27.8	36.6	35.7	22.6	25.4	26.3	27.4
Index (June—100)	100	70.6	92.9	90.6	57.4	64.5	66.7	69.5
Average earnings per hour, cents	47.3	57.7	64.6	63.9	64.0	64.0	64.7	65.0
Index (June—100)	100	122	136.6	135.1	135.3	135.3	136.8	137.4
Average earnings per week	18.64	16.04	23.64	22.81	14.46	16.26	17.02	17.81
Index (June—100)	100	86.3	126.9	122.3	77.6	87.2	91.3	95.5

*June reported total payroll × index of total hours for the particular month.
†Reported total payroll, minus theoretical total payroll.

retirement income plan for its employes: Contribution of 2 per cent of their total wages by employes; company to assume the major portion of expense of administration; benefits granted on normal retirement to amount to 6¼ per cent monthly of total contributions; retirement age of 70 for men and 65 for women.

Production

AFTER holding two weeks at 54½ per cent, steelmaking operations eased to 53 per cent last week, indicating that steel producers have practically exhausted their momentum. Sharp losses in the Wheeling, Cleveland, Pittsburgh and Chicago district cancelled gains at Youngstown and Birmingham. Mill schedules for this week indicate that the rate may do well to hold at this level.

Youngstown operations gained 2 points last week to 60 per cent and are expected to hold at this level this week.

Pittsburgh steel operations declined 5 points to 39 per cent, due largely

Steelmaking Operations

Percentage of Open-Hearth Ingot Capacity Engaged in 10 Leading Districts

	Week ended Feb. 16	Change	Same week 1934	Same week 1933
Pittsburgh	39	— 5	26	18
Chicago	63	— 4	38	19
Eastern Pa.	31	None	27½	11
Youngstown	60	+ 2	45	21
Wheeling	87	— 3	69	†
Cleveland	77	— 5	79	36½
Buffalo	45	None	42½	19
Birmingham	55	+23½	52	17
New England	63	None	82	†
Detroit	100	None	79	†
Weighted av.	53	— 1½	43	19

†Not reported in 1933.

to a cut-back in open hearth schedules by two leading interests. Another blast furnace was blown in, as Bethlehem Steel Co. resumed with a fourth stack at Johnstown, Pa. Carnegie continues with 9 active, National Tube 2, Jones & Laughlin 7, and Pittsburgh Crucible Steel Co. and Pittsburgh Steel Co. each 1. Blast on most of these furnaces is now being checked. Due to one producer dropping an open hearth, Wheeling steelmaking declined 3 points to 87 per cent, leaving a total of 32 out of 37 on schedule.

Chicago dropped 4 points to 63 per cent, due entirely to curtailed schedules by one interest, although operations at other plants are holding well and no marked decrease is in immediate prospect. Fourteen blast furnaces continue active.

Suspension of operations by two eastern Pennsylvania plate producing plants, were offset by one producer

(Please turn to Page 82)

Del Monte Conference Sets Attendance Record; Coast Fabricators Organize

DEL MONTE, CALIF.

OPTIMISM on the future of the steel industry of the nation and on the Pacific coast, in particular, was the keynote of the eleventh annual conference of the Iron, Steel and Allied Industries of California, held at Del Monte, Calif., Feb. 7-9.

The meeting was not only the most successful one ever held by the conference but the attendance, by delegates closely identified with the industry, also was the largest on record, being over 250.

A resolution was approved opposing various California legislative proposals to "restrict the length of railroad trains, to restrict the number of hours per day or week of railroad labor, and other similar measures which would have the effect of greatly increasing the cost of transportation."

As noted in STEEL for Feb. 11, page 16, speakers included Norris J. Clarke, vice president in charge of sales of the Republic Steel Corp., Youngstown, O.; Clyde G. Conley, president, American Institute of Steel Construction Inc.; Walter S. Doxsey, secretary, American Steel Warehouse association; W. E. Emmett, Pacific coast engineer for the institute, pointed out advantages of steel construction on the coast.

An outgrowth of the convention was the formation of the Pacific Coast Steel Fabricators' association, composed of Oregon, Washington and California interests. The purpose of the new organization is to handle matters of sectional nature and will, in no way, attempt to supplant the work of the American Institute of Steel Construction, Inc.

Reese H. Taylor, president, Consolidated Steel Corp., Los Angeles, is temporary president. Other temporary officers include: Vice presidents, George H. Raitt, Steel Tank & Pipe Co., Berkeley, Calif.; Paul Pigott, president, Pacific Car & Foundry Co., Seattle, and Paul Gillespie, sales manager, Judson-Pacific Co., San Francisco. T. A. L. Loretz, Consolidated Steel Corp., Los Angeles, is acting secretary, with offices in the Central building, Los Angeles.

State Group Elects Leaders

W. W. Glosser, of Hubbard & Co., Emeryville, Calif., was elected president of the Iron, Steel and Allied Industries of California; E. H. McGinnis, Union Hardware & Metal Co., Los Angeles, vice chairman; and C. S. Knight, California state chamber of commerce, secretary.

The executive committee is composed of the following, the first-named under each division representing northern California and the second southern California:

Reinforcing Steel—R. G. Falk, W. C. Hauck & Co., San Francisco; E. B. McClure, Truscon Steel Co., Los Angeles.

Steel Mills—William A. Ross, Columbia Steel Co., San Francisco; P. W. Cotton, Pacific Coast Steel Corp., Los Angeles.

Traffic—T. E. Banning, Columbia Steel Co., San Francisco; T. A. Loretz, Consolidated Steel Corp., Los Angeles.

Tubular—F. E. Elliott, Crane Co., and J. D. Fleming, Grinnell Co., San Francisco; J. A. Crawford, Republic Supply Co., and H. E. Howard, Ducommun Corp., Los Angeles.

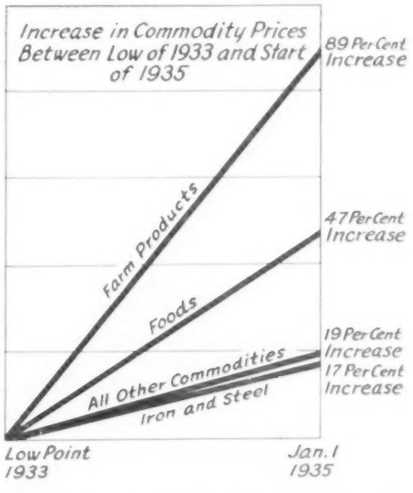
Merchant Steel—G. W. Boole, A. M. Castle & Co., and H. M. Taylor, Taylor-Spotswood Co., San Francisco; E. H. McGinnis, Union Hardware & Metal Co., and Donald Priest, Los Angeles Heavy Hardware Co., Los Angeles.

Foundries—Charles P. Hoehn, Enterprise Foundry Co., San Francisco, and C. M. Henderson, Macaulay Foundry Co., Berkeley, Calif.; C. B. Tibbetts, Los Angeles Steel Casting Co., and C. A. Stilson, Metal Trades Manufacturing Association, Los Angeles.

Purchasing Agents—F. P. Summers, Standard Oil Co., and A. J. McClean, Utah Copper Co., San Francisco; E. F. Watkins, Southern California Edison Co., and W. H. Jackson, Axelson Mfg. Co., Los Angeles.

Manufacturers—George Raitt, Steel Tank & Pipe Co., Berkeley, Calif., and R. H. Petillon, Western Pipe & Steel Co., San Francisco; G. A. Axelson, Axelson Mfg. Co., and H. Detrick, Josslyn Mfg. Co., Los Angeles.

Easy on the Customer



Price recovery in iron and steel products between the low point of 1933 and the start of 1935 was below the average for all commodities surveyed by the bureau of labor statistics, Washington, and only a fraction of the advances in farm products and foods, as sponsored by the new deal

Ancient centers of the iron industry, and main trade routes

Tracing Origin of Iron Back to Central Europe Deepens Its Antiquity

BY HARRY CRAIG RICHARDSON

THIS article, first of a series of three, is an abridgment of an article by Mr. Richardson entitled "Iron, Prehistoric and Ancient," published in The American Journal of Archaeology, Vol. XXXVIII, No. 4, October-December 1934. The editors' permission to reprint is hereby acknowledged

FIFTY years ago a controversy arose between the proponents of a high antiquity for man-made iron and those maintaining a similar position with regard to bronze. Archaeological evidence, though not wanting, lacked its present authority and the conflict was waged around classical legend and the cultural significance of a few undocumented objects of early iron and bronze.

Echoes of that controversy still reverberate as current tradition—none more persistent than a widespread belief that industrialization of iron first occurred in the East. The truth in the matter appears now to be precisely the reverse. There is no warrant for either bronze or iron in the Orient until after their appearance in Europe, where, as most authorities are at present agreed, the Bronze Age begins about 2000 B.C. and the Iron Age opens 1000 years later.

The origin of iron seemingly presents a difficult problem. Its ores are found everywhere, and the chief concern then, as now, was not one of amount, but the kind, and whether the ores within reach could be reduced economically Fifty years ago the enormous deposits of the Lake Superior district were similarly in question—a doubt happily resolved by the timely invention of the basic process and an ingenious system of transport.

The problem of origin is further conditioned by an obvious lack of technical knowledge in many localities. Even with suitable ores, a claim, to be sound, must also imply the ability and the need to invent a new process.

Practical Use Counts

Let it again be repeated that "origin" or "discovery," as the term is used here, means the production in quantity of a variety of forms. Rings, amulets and beads, casual by-products of the copper-bronze era, are not especially significant. But when iron weapons and implements begin to appear—when these objects grow larger and their numbers tend to increase—then, and then only, the fact becomes clear that the production of iron has really begun.

Obviously this would occur first where good ores are abundant, and where the fundamentals of metallurgy had been gradually acquired through prior experience with copper or bronze. Economic necessity may have forced the event.

Metallurgically, the operation of this is discernible in the rapid advance of some regions to a developed bronze culture, and in a seeming reluctance to take the next step and go forward with iron. Egypt perhaps offers the classic example. For centuries her metallurgists kept the pace, skilfully adapting a remarkable copper-working technique to the production of bronze. This was no easy transition, for, without supplies of her own, tin was obtainable only through conquest or trade. But the vigor was lacking in the closing phase of a war-worn empire (1200-1090 B.C.) to abandon bronze and take up iron.

No doubt the Egyptian metallurgists had knowledge of it; vague rumors, even specimens, of the marvelous new metal were bound to have filtered in. Some attempts may even have been made to apply it, but in face of the difficulties, these would soon be abandoned. At tremendous cost a stable and profitable bronze industry had been built up; bronze had in the past met every need.

Conceivably, iron might be a metal of future promise, but in the immediate present it was no harder, no more durable, and was infinitely less

beautiful than the familiar bronze. Successful reduction demanded, moreover, radical changes in the existing technique. Most important of all, good ores were required—and where were such ores to be found?

Here there is a divergence of responsible opinion. Some authorities maintain that iron, as well as copper, was present in the deposits of the Sinaitic peninsula; others claim, on the contrary, that no iron is to be found there now and that it never existed. A few Egyptologists have pointed to distant Nubia as a probable source; but the oldest known mining sites there appear to be Roman. That these deposits were not worked until a comparatively late date is also implied by Herodotus.

Egyptian Ores Worthless

The point really at issue in such discussions of fact is not whether iron ores were available, but rather what kind. Low grade hematites of the variety mined in Egypt today would be practically worthless to a primitive industry because of the deleterious oxides which form the gangue. Thus concept and evidence combine to refute the pretensions of Egypt. There is no valid authority for iron among the Egyptians before the Assyrian conquest.

In the Tigris-Euphrates valley, as along the Nile, the tide of early civilization advanced with copper, and receded with bronze. Iron, if known, was exceedingly rare and never attained industrial rank except in Assyria. And though an inscription of Tiglath-Pileser I (1125-1100 B.C.) is frequently cited as proof of an earlier dating, there is no warrant in fact for Assyrian iron until the eighth century B.C. It is important to observe, however, that the iron hoards found at Khorsabad, Nimrud and Nineveh are the earliest known of any considerable size in the ancient East. Significant, too is the fact that they occur in Assyria with its flanks in the Caucasus and on the central plateau of Asia Minor.

Difficult to Trace Chalybes

The classical tradition has led many authorities to accept northeast Asia Minor, or the Caucasus, as the probable source of the metallurgical art and the birthplace of iron. Thither sailed the Argonauts in quest of the golden fleece; there dwelt the Chalybes, most renowned of the iron-workers in all antiquity. But whence came the Chalybe tradition is vague, though the allusions of Aeschylus point to a Scythian origin.

Syria-Palestine, in spite of its later renown, does not appear to have been an early worker of iron. From first to last its industrial-commercial activities were determined by the usage of Egypt and Babylonia for whom it alternately served as a region of trade or a field for conquest and plunder. It is entirely admissable that the exiled Aegeans, the Philistines of Hebrew history, had knowledge of iron in the tenth century B.C. Such knowledge, however, would have come from the West and its roots must be sought in Europe.

China and India were too far removed from the stream of developing western civilization to have contributed to, or been influenced by, the early working of iron. No piece of metal found in China can be dated prior to 1200 B.C.; and the earliest recorded use of iron goes back only to the eighth century.

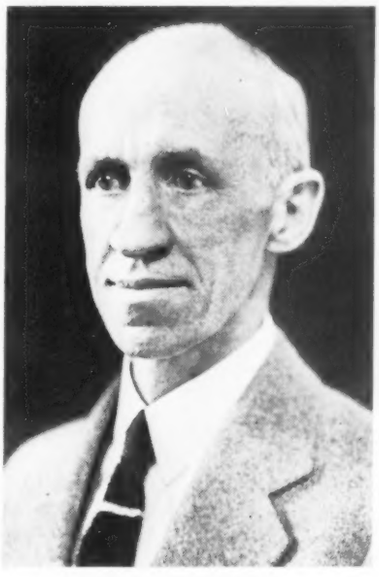
India, whose civilization is apparently later than that of China, seems to have passed directly from the use of copper to that of iron. On the evidence, any early dating for iron is inadmissible at present. It can only be claimed with reasonable assurance that in 326 B.C. the supreme excellence of Indian iron became known to the western world through the conquest of Alexander.

The theory of a Central European origin for iron is not new. More than 30 years ago Sir William Ridgeway suggested that the Achaean invasions of about 1400 B.C. brought iron into Greece; and he sought to trace through the arms of the Achaeans before Troy certain affinities with Hallstatt. Whether the Achaeans brought iron into Greece may be open to question; but that the Dorians did, there can be no doubt. Thus by 1000 B.C., at the latest, iron was reaching the Mediterranean coasts from beyond the Danube.

Point to Central Europe

In substance, then, archaeological evidence establishes the time when man first produced iron for weapons and implements at about 1000 B.C. It points unmistakably to Central Europe and the Assyrian uplands as the most probable places of origin. Nowhere else, with anything like a comparable dating, have objects been found in sufficient quantities to warrant a belief that iron had come into general use.

And if precedence for the West is claimed here it is only because, in addition to the evidence of objects, Central Europe appears more nearly to fulfill the combined premised conditions of available ore, metallurgical knowledge and the economic necessity to develop iron.



Harry Craig Richardson

NOW in the sales department of the Republic Steel Corp., Cleveland, and formerly associated with the Donner Steel Co. and the United Alloy Steel Corp., Mr. Richardson has amalgamated in his research an accurate understanding of metallurgy and present-day market conditions with a lively interest in things historical. Prompted by a casual inquiry concerning the origin of iron, he has devoted the spare time of more than five years to a study which has taken him from the British Museum to the sands of Hyderabad. Many historical works he has read in the original. In a reproduction of an ancient furnace he has duplicated primitive processes; by smelting the black sands of Arizona he has subjected theories to actual practice and determined their validity. Mr. Richardson's objective in his penetrating research has been to relate human history in terms of iron

AT THE opening of the second millennium, the cultural gap between the East and the West was perceptibly closing. Barter and exchange were common and fairly continuous between Europe and the Levant at adjacent points, or along the coasts. Metals, salt, amber, pottery, implements and fabrics were the commodities most in demand.

Overland and by inland stream the raw materials of Europe were reaching the coasts. Lead, silver and copper from Spain, tin and possibly a species of natural bronze from Cornwall or Bohemia, returned inland again in the form of implements, weapons and ornaments. Powerful communities grew up at the various entrepots, notably in Spain on the Hellespont, at which latter point Troy II (2400-1900 B.C.) was already a thriving industrial center. Trade with Central Europe was continuous and relatively easy from there, by way of Maritza, Morava and the Danube valleys.

Where Civilization Met

It was precisely here, in the upper Danube valley, in a district corresponding to modern Bohemia, Bavaria and Austria, that two streams of Eurasiatic civilization met and struggled for industrial supremacy. For about 2000 B.C. there arrived in Bohemia, coming by way of Spain,

Sardina and north Italy, a people, named from the character of their pottery the Bell Beaker Folk. Little is known of their antecedents, but it is evident that they were metal workers of skill and experience; furthermore, and in contradistinction to the Trojan traders, the Bell Beaker Folk appear to have been colonizers.

In any event, coincident with their arrival a definite metal culture arose in Central Europe, which, known as the Aunjetitz, spread over Silesia, Saxony, Moravia, Bavaria and Bohemia. This was followed less than 500 years later by a more developed metal industry, the so-called Lausitz culture, which appears to have included the working of bronze.

Develop Faster than Orientals

Thus by the middle of the second millennium, the peoples of Central Europe had arrived at a metal culture comparable in its basic principles with that of the ancient East; and, what is even more astonishing, in a few hundred years they had accomplished a development which had taken the Orient as many thousands to achieve.

Shortly after 1500 B.C. the Lausitz people coalesced with newly-arrived dwellers in the Hungarian plain, and together they spread in every direction.

While these momentous events were taking place in Europe, the long mounting tide of eastern civilization was overflowing its traditional boundaries. The standards of Egypt, through the vigorous campaigns of Thutmose III (1501—1447 B.C.), had been planted on the upper waters of the Euphrates, and all Syria-Palestine paid tribute to the Pharaoh. From far-off Babylon and beyond Taurus where dimly discernible an Hittite empire was rising to power, came messages of good-will and respect for the mighty empire of Egypt. The star of Assyria had not then risen; the conquests of Chaldaea and Persia lay yet a thousand years off.

No More Serviceable Than Iron

Amid the confused struggles of these eastern nations at death-grips, the clash of metal upon metal is heard above the din, but always it is that of copper or the newly-discovered bronze, never the ring of iron. It is better bronze or copper perhaps, and the weapons themselves are more skilfully executed, more beautifully ornamented, but, after all, no more destructively serviceable than those of Europe.

One hundred years after Thutmose, the Hittite empire, dominating the central plateau of Asia Minor, had come into being, and emigrants from Thrace, Thessaly, even distant Illyria, had settled in the Troad; or, ascending the Sangarius (Sakaria) valley, were to be met as far east as the Halys (Kizil Irmak) river.

Possibly it is not coincidence that the earliest references to iron in the Asian-Egyptian texts correspond so nearly in time with invasion from Europe; that the clearest and best are a part of, or concerned with, the Hittite record. Far from surprising, this is precisely what might be expected to follow a European origin. Naturally the Hittite kingdom, dominating Asia Minor, would in that case be first of the eastern empires to acquire the knowledge. And though absolute proof of a west to east trend is now lacking for iron, the influence of Europe upon Hittite affairs, generally, can no longer be doubted.

That the use of iron was forced upon Asia by conquering races is also implied in the widespread development of a taboo. This is most evident among peoples who were at great disadvantage in securing the necessary raw materials, or who were so situated otherwise as to be decidedly limited in facilities for working them.

Put Taboo on Iron

Thus an iron taboo is especially strong among the early Hebrews, who not only were without raw material, but cut off on all sides from supplies of the semifinished product.

But the belief that iron was an intruder in the East rests on more solid foundation than the inferences to be drawn from any taboo. From the upper cataracts of the Nile to the Caucasus and from the Euphrates to the Aegean Sea there are no deposits of iron to compare in quantity or quality with those of Europe. Nowhere in western Asia is there a known occurrence of spathic, the ore best adapted to the groping technique of an original iron metallurgy.

In Europe the situation was quite the reverse. There, several localities had extensive deposits of manganiferous spathics. That these have been worked from immemorial times is abundantly evident.

Classical historians speak vaguely of Iberians in the west, Ligurians around the mouth of the Rhone, and Illyrians along the eastern shore of the Adriatic; but whether these were indigenous peoples, or an intruding fold, is not yet clear. It is certain, however, that they, and other European races beyond the vision of history, were workers of metal, and the temptation is strong to credit them with a knowledge of iron. But any such theory, however developed, lacks supporting evidence; and until this may accumulate, the opening of the Iron Age, for both Europe and Asia, can be dated only from the Hallstatt burials.

THE Hallstatt cemetery lies in a defile of the Noric Alps some 30 miles east and south of the Austrian city of Salzburg. In 1846 and the years immediately following, this cemetery was excavated by Ramsauer. So remarkable was the culture here laid bare that "Hallstatt" has taken rank as a type-name, and is now used to identify other and similar sites such as those uncovered by excavation in the provinces of Styria and Carniola, at Glasinatz in old Bosnia, and Bologna.

In State of Transition

Altogether nearly a thousand burials were opened at Hallstatt, and the wealth of material exposed included objects in gold, amber, glass, bronze and iron. Swords, daggers, axes, spear-heads and javelins were found, many of iron, though a few were bronze. The fact that the iron objects were, in most cases, mere slavish copies of those in bronze, indicates clearly that Hallstatt was a transition-type station whose inhabitants, in the years around 1000 B. C., were passing from the use of bronze to the working of iron.

Who those inhabitans were is not yet clear. The fact that cremation and inhumation were both practiced on this site indicates the presence of two or more races, possibly an Illyrian sub-stratum overlaid by Nordic invasion.

But whether Illyrian or the culture of some unknown race, the astonishing fact is that here in the Hallstatt cemetery lay visible evidence of the earliest comprehensive use of iron by man. Nowhere else has such an abundance and variety of iron objects been found with a comparable dating, and it is obvious, of course, that the Hallstatt forms are merely type-representatives of a long evolutionary process.

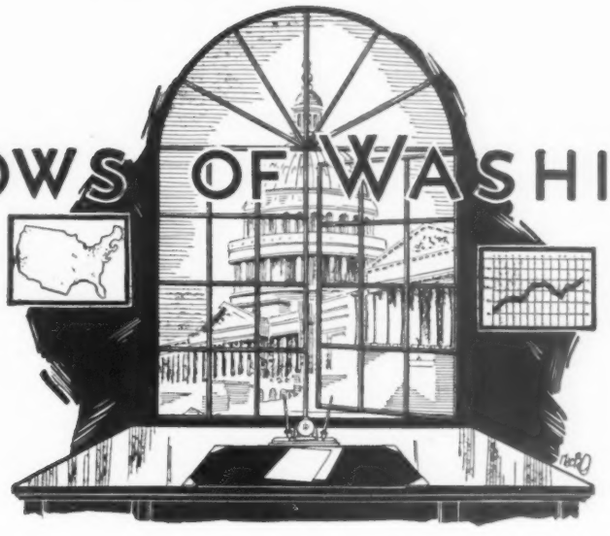
Evidence Indicates Danube

How far anterior to 1000 B. C. the working of iron began in this region is sheer speculation. All that can now be said with reasonable assurance is that it could not have been prior to 1500 B. C.; and the probabilities are that it was some two or three centuries subsequent.

Was it here in the Danube valley, then, that the fires of the iron industry were first lighted? Is it probable that a people so young in the metallurgical art could have been first to achieve this momentous advance? Hallstatt and the archaeological evidence point an affirmative answer; but that, taken alone, is not necessarily conclusive.

(To Be Continued)

WINDOWS OF WASHINGTON



WASHINGTON

TWO weeks ago, when NRA opened its hearing on employment provisions of codes, William Green, president of the American Federation of Labor, was the leadoff speaker for the labor side. Standing before the microphone in the department of commerce auditorium, he laid down the law to NRA and employers and fiercely proclaimed the iniquity of any work week longer than 30 hours. For a man of the brushless type, he worked up a remarkable lather.

But few in addition to those on the rostrum observed that in the front row, center, of the audience sat John Lewis, president of the United Mine Workers and probably the most aggressive of higher leaders of the federation. His right arm supporting his leonine head in a sidewise pose, he sat immobile and inscrutable during Mr. Green's presentation. Mr. Lewis' gaze never left Mr. Green, and Mr. Green occasionally shot a hasty glance at Mr. Lewis.

TIME RIPE FOR ACTION?

It would be worth much to steel to ferret out Mr. Lewis' thinking, for it may change the entire course of labor relations in the industry. The prime question is, does the bloc which prefers Mr. Lewis' leadership of the labor movement believe the time has come for more aggressiveness than has been displayed under Mr. Green? If so, it bodes ill for steel and foreshadows an organization movement making any efforts of the past two years mere child's play.

The past few years, according to common report in Washington, there has been a bloc within the federation only awaiting the word from Mr. Lewis to make him president. Always Mr. Lewis has withheld that word; he has put his support behind Mr. Green and apparently given him his chance. Only a week ago, it is understood, there was the equivalent of a palace revolution in the executive council of the federation, and a dictatorship which would have left Mr. Green only a nominal leader came within several votes of success.

However, the trend against the conservatives appears to be irresistible. The building trades department is torn wide open by opposing factions. The greatest opportunity ever afforded organized labor, by section 7a, seems to have been muffed. Last September, the Amalgamated Association of Iron, Steel and Tin Workers polled exactly 1½ per cent of the labor in the steel industry. The past few weeks, the federation has shown a strength of about 2½ per cent in the automobile industry.

SNUBBED BY PRESIDENT

The President has virtually informed the federation that it does not represent the labor element of the country, and his action in renewing the automobile code and continuing the proportional representation labor board was a severe rebuff, whatever one may think of the collateral snub to the industrial recovery board.

In fact, some new dealers hint that the craft form of organization, to which the federation appears wedded, is passe, and that it may be a function of the new deal to organize labor on a vertical basis paralleling the codification of industry. This smacks somewhat of the regimentation under fascism.

So, the federation is under fire from the administration as being inadequate, and within the fires of rebellion of the more aggressive leaders are burning brighter. The pressure was intensified last week when the "rank and file" committee of the Amalgamated descended upon Washington and conferred unofficially with Mr. Green, at about the same time he went into conference with Michael Tighe, conservative president.

Crystallizing what Washington is surmising, suppose that Mr. Lewis and his aggressive bloc attempt to rejuvenate the federation. Suppose that they accept as a mandate the resolution of the San Francisco convention last fall that the iron and steel industry be organized. Suppose that Mr. Lewis throws into the steel industry the organizers, trained on a vertical basis, who have welded the coal miners into an organization of some 300,000, with dues at $1 per man per month collected through the checkoff.

That is something for steel to think about.

Washington also speculates whether the counter attack of the industry would be to group the present employe representative associations into a national setup. As is known, this has been considered by steel executives, but abandoned for the reason it would invite outsiders to bore within and take over a ready-made national organization, or might offer an oportunity to some member with a flair for leadership and Napoleonic ambitions.

In any event, steel needs to keep its eye on two men—Mr. Lewis and Edward F. McGrady, now assistant secretary of labor and formerly a federation lobbyist at the capitol, and considered the best at his trade.

PRINCIPALLY because they are so incredible, the government's suits to halt the merger of the Republic Steel Corp. and Corrigan, McKinney Steel Co. and attempting to unlock some steel directorates have attracted comparatively little attention in Washington. But the background is interesting.

WORK OF TYRO LAWYERS

From the verbiage in the suits it is evident that they were drawn by attorneys unfamiliar with the industry, and apparently in haste. Considering the pressure upon the department of justice by the various gold clause actions, there is some speculation as to how deeply higher officials of the department went into the matter.

By no means is it considered here that the government has an open and shut case against the merger, and it may have some difficulty convincing a

court that Republic and Corrigan, McKinney are competitive. Many regard the statement of Tom M. Girdler, Republic chairman and president, that the merger will stiffen competition against other producers as an irrefutable one.

Take the allegation that there is danger to the consumer because Myron Wick is a director both of Republic and the Delaware River Steel Co. In the first place, a family connection rather than a business motive is responsible for Mr. Wick being on the Delaware board. The Delaware company has a small blast furnace at Chester, Pa., which has not operated since May 8, 1930, or almost five years, and its only product is merchant iron. Not a pound of steel does it make.

There is a good deal of speculation as to what part the federal trade commission played in bringing the suits. It looks to some as if the political aspect were the dominating one. And business generally will be asking under what rules it can operate. Republic is understood to have had virtual approval by SEC of its statement, which cost over $1,000,000, with no intimation that it would come under the enfilading fire of another government agency.

The danger is that the suits may drag and the merger and attendant financial reorganization of Republic may be delayed indefinitely. Which would cause no pain to the automobile industry, one sector of which wanted to take over Corrigan, McKinney several years ago.

In the outer office of Mr. Girdler in Cleveland hangs the motto, "Don't worry—it won't happen." But it did.

THAT proposed shelter belt of trees from Canada to Texas appears not to have been laughed out of court. Last week the forest service announced that it will go ahead this spring with part of the project, starting with 4,000,000 trees.

Originally, a requirement of 55,000,000 fence posts, weighing 192,500 tons, and 165,000 tons of barbed wire and mesh fencing was visualized. How much this has been reduced is not known. Any buying will be done by the Lincoln, Nebr., office of the forest service department of agriculture.

Russia To Build "World's Largest Plant for Making High-Grade Steel"

BY M. N. JURIN

SOVIET Russia is becoming a land of big industrial plants. In the last few years such industrial giants as the Magnitogorsk, Kouznetsk, Azov and other steel locals have been built, with blast furnace capacities of 1000 tons and more, unknown in Europe before the war. Now the Soviet engineers are starting another ambitious project for making high-grade steel. This is to be a plant at Bakal, which if built according to the design calling for 1,778,000 tons annual output will be the largest single plant in the world for the production of such steel.

The basic features of the project are given in the Soviet official edition *Izvestia*, in the article by A. I. Jarikoff, general manager of the plant's construction.

Near Large Ore Deposits

The plant will be located in the Ural mountains, near Cheliabinsk, at large iron ore deposits remarkable for their freedom from phosphorus and sulphur. In the opinion of Soviet engineers, pig iron made from Bakal ore in the charcoal blast furnaces is not inferior to Swedish pig iron. They believe the high quality of the ore makes possible the production of high-grade steel by the ordinary open-hearth process, instead of the more expensive electrical smelting.

Coking coal has to be transported by railroad from Kouznetsk or Karaganda, both located in Siberia, approximately 1500 miles from Bakal.

100-Ton Open-Hearth Furnaces

There will be three blast furnaces, each of about 1100 tons capacity. The steel division will contain three departments. The first will produce plain carbon steel ingots. This department will be equipped with ten stationary 100-ton open-hearth furnaces with a total annual capacity of 640,000 tons.

The second department with ten 100-ton tilting open-hearth furnaces is designed to produce 540,000 tons of steel ingots annually. This department also will deliver 256,000 tons of liquid metal a year for electrical smelting. For this purpose three electric furnaces of 30-ton capacities will be installed.

The third department is designed to produce 176,000 tons of high-grade steel. It will be equipped with five 40-ton acid open-hearth furnaces, two 60-ton basic, and two 3-ton electric furnaces.

The rolling mill department will be equipped with three blooming mills, two of which will be coupled, one continuous roughing mill, and five finishing mills. One of the finishing mills will have annual capacity for rolling 400,000 tons of heavy sections; another, 170,000 tons of medium sections; a third mill will roll spring steel; and two merchants mills will have capacity for 230,000 tons.

The heat treating plant, according to Soviet design, will handle up to 200,000 tons of steel.

Would Avoid Ferroalloys

It is of interest that Soviet engineers are trying to do away as much as possible with the use of ferroalloys in making of steel, attempting to substitute the complex ores instead. They are experimenting with the Sverldlovsk, formerly Ekaterinbourg, chrome-nickel ores for this purpose.

Fifty per cent of the Bakal steel will be absorbed by local industries. The largest consumer will be the Cheliabinsk tractor plant. This was designed to make 40,000 tractors a year, but it is assembling only one quarter that number at present because of insufficient supply of steel. Another large consumer will be the Pervo-Uralsk tube mills. Output here also is restricted by lack of steel.

The Bakal plant will employ about 27,000, including 2000 engineers and skilled technicians. Soviet engineers plan to start operating the plant in the second half of 1936.

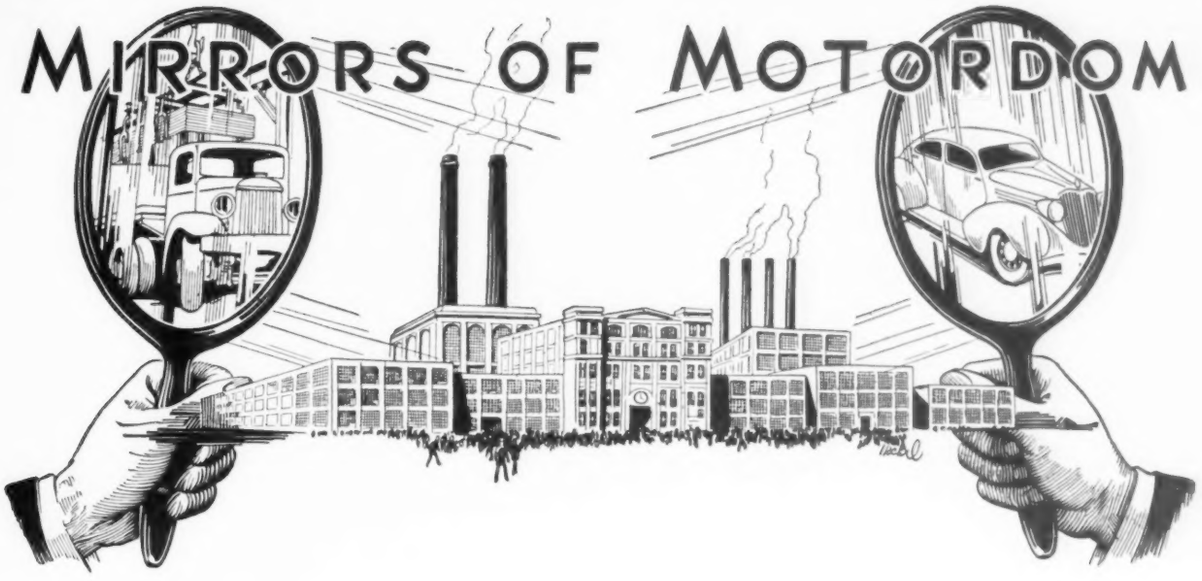
The author is a mining and metallurgical engineer, Los Angeles.

Steel Founders Choose District Directors

Steel Founders' Society of America elected the following directors at a meeting in Cleveland, Feb. 13:

District 1, Harrison Hoblitzelle, General Steel Castings Corp., Eddystone, Pa.; District 2, Keith Williams, Pratt & Letchworth Co., Buffalo; District 3, J. W. Glover, Glover Machine Works, Marietta, Ga.; District 4, D. C. Bakewell, Continental Roll & Steel Foundry Co., East Chicago, Ind.; District 5, E. L. Brooks, Sawbrook Steel Casting Co., Cincinnati; District 6, Joseph O. House, National Malleable & Steel Castings Co., Cicero, Ill.; District 7, Paul H. Leussler, Omaha Steel Works, Omaha, Nebr.; District 8, J. P. Arnoldy, Warman Steel Casting Co. Ltd., Huntington Park, Calif.

F. A. Lorenz Jr., American Steel Foundries, Chicago, was re-elected president of the society, Merrill G. Baker executive vice president, and R. L. Collier secretary-treasurer.



DETROIT

IN ITS ability to make close adjustment between production and demand, the automotive industry is superior to the average large manufacturer. Constant checks are made on the retail outlook and schedules are revised correspondingly, if necessary.

When output was stepped up at an unusually sharp rate late in December and early in January, however, there were some who questioned whether this activity was predicated wholly on sales prospects. More detailed figures on retail deliveries demonstrate that manufacturers were not over-optimistic in their projected schedules, and that some dealers underestimated potential demand.

General Motors in January sold 75,727 passenger cars and trucks to domestic dealers, while consumer purchases amounted to 54,105 units, or 71 per cent of the total. A year ago retail sales were only about 50 per cent of the number ordered by dealers. The public bought 130 per cent more units than it did last year while dealers increased purchases only 64 per cent.

DEALERS NOT STOCKED

Ford's domestic production in January was 91,043 cars and trucks, a gain of 75 per cent over 1934, while retail sales were 75,678, an increase of 110 per cent. In other words, Ford sold at retail 83 per cent of its output, against less than 70 per cent a year ago. World production by Ford of 105,230 units was the highest for January in six years.

The small difference between production and retail sales for both Ford and General Motors indicates that dealers are far from acquiring what is considered a normal stock of new models, and that in view of the fact that the active buying season does not develop until second quarter, further gains in output are assured during March and possibly April.

It is almost too much to hope that car sales during spring months will bear the same ratio to the January volume, such as occurred the past few years. In 1934 registrations from April to July were three to four times as large as during January, but in the latter month several companies were delayed in shipping cars because of manufacturing difficulties encountered at that time.

Early in 1933 the country was becoming jittery over the impending banking crisis and was but little concerned over buying automobiles. It is likely, therefore, that by spring sales comparisons with last year will be less favorable than that shown for January.

400,000 FOR FEBRUARY

Unless something unforeseen should develop, however, the recent rise in production will continue through March. January's output of 306,000 cars and trucks in the United States and Canada sets the industry off to a flying start, the impressiveness of this total being emphasized by the fact that only two years of the past ten—1929 and 1926—recorded a higher figure for the first month. Only in 1929 have assemblies reached 400,000 during February, yet this mark will be approached during the current month if schedules projected by several manufacturers are realized.

Principal gains this month are being shown by Ford and General Motors. Chrysler units had a head start on most of their competitors and are making a relatively smaller percentage gain over January than the others.

Ford aims to turn out nearly 40,000 more units than it did last month, while Chevrolet should better its January total by 25,000 to 30,000.

Oldsmobile had the best January in its history, building about 10,000 cars, or four times as many as last year, while the February schedule is 15,500 units.

Pontiac will show a gain of several thousand cars this month.

Based on these and other proposed increases, the February total for the industry is indicated conservatively at 375,000 to 400,000 cars and trucks. If sales continue to gain at anything near their recent rate, March assemblies bid fair to top the 400,000 mark since further expansion in Ford and Chevrolet schedules should more than offset what declines occur among manufacturers who will have completed dealer stocking by that time.

Recent and current activity of the industry is ample evidence of the correctness of the contention made during previous dull years that the hold of the automobile on the public and its steady transformation from a luxury to a necessity would stimulate its sale immediately upon the strengthening of purchasing power. Manufacturers now are cashing in on the postponed buying which for several years resulted in more cars wearing out than were replaced.

REGISTRATION DROP HALTED

During the five years, 1925 to 1929, total replacements represented about 75 per cent of the number of units registered at the end of 1924. From 1930 to 1934, however, the number of replacements was only about 40 per cent of the total operated at the end of 1929. It is significant that the decline in registrations which started in 1931 was arrested last year after a drop of 2,825,281 from the all-time peak of 26,545,281. The 1934 increase was 1,120,000 units to a total of 24,840,000.

Ford continues to operate its open-hearth department full and it is estimated that more than 150,000 tons of semifinished steel now has been accumulated in anticipation of ad-

ditional requirements when the new continuous sheet mill is ready for operation. Whether Ford later will add more open-hearth capacity is a matter for conjecture.

Great Lakes Steel Corp. also could use additional steelmaking facilities, its finishing mills currently absorbing more semifinished material than the mill can produce. The steel code's existence, however, makes construction of additional open-hearths a matter for future consideration.

Ford might be regarded as having taken one step in that direction with the increasing of the capacity of its two blast furnaces from 600 to 800 tons daily, though the expansion in foundry capacity was a factor in enlarging the stacks.

SPECULATE ON "STOUT SCARAB"

While the Stout rear-engine car introduced recently is not considered by other manufacturers as serious competition at present, due to the limited production schedule set for it this year, various engineering departments are giving serious thought to the basic features of this car. None other than Edsel Ford was quoted last year as opining that the automobile of the future would have its motor located at the rear, the future being indicated as two or three years hence.

It has been demonstrated that such a car can be built and there are obvious advantages to the design, but until somebody can find a simple but sure method for changing the public's conventional taste in automobile appearance, contemporaries of Mr. Stout's Scarab may be slow to develop unless some large manufacturer is willing to take the plunge.

Chrysler found last year that the average car buyer takes to radical changes slowly, but now has the satisfaction of seeing most of the important features of the airflow cars adopted on competing makes in 1935 models. While it would be possible to build a car of conventional appearance but with rear-engine mounting, the space-saving feature would be lost.

H. H. Franklin Mfg. Co. has been ordered to pay $224,656 to creditors. This is slightly more than 10.5 per cent on approval claims totaling $2,130,305, representing the balance remaining after payment of expenses of the bankruptcy proceedings and state taxes.

Insurgent labor at Lansing has decided it is not strong enough to cause an effective strike there. Federation leaders have advised workers to wait until their membership has increased before attempting a walkout. The strike called a short time ago at the Fisher plant in Lansing proved only a gesture.

Briggs, running near capacity, is planning improvements at its Mack avenue plant to enable it to produce pressed steel plumbing ware which the company has developed the past few years. Briggs' employment at 29,666 is a record for the company.

Automobile Production

Passenger Cars and Trucks
U. S. Only
By Department of Commerce

	1933	1934	1935
Jan.	128,825	156,907	300,000*
Feb.	105,447	231,707	.....
Mar.	115,272	331,263	.....
Apr.	176,432	354,745	.....
May	214,411	331,652	.....
June	249,727	308,065	.....
July	229,357	266,576	.....
Aug.	232,855	234,810	.....
Sept.	191,800	168,171	.....
Oct.	134,683	132,491	.....
Nov.	60,683	78,465	.....
Dec.	80,656	183,187	.....
Year	1,920,057	2,778,739	.....

*Estimated.

Estimated by *Cram's Reports*

Week ended:	
Feb. 9	78,453
Feb. 16	82,119

LATEST fly in the soup of carbuilders is the report from some localities that static charges of electricity build up on the sleek surfaces of the new streamlined creations as they slip through the breeze. Measurements are claimed to show that these charges run as high as 8000 volts.

NEW VERSION OF SPARKING

While the amperage involved is, of course, insignificant, there is enough to cause an annoying spark to jump to the fingers of a person touching the car. Bridge tenders, gasoline service station attendants and women drivers are said to have registered complaints.

It is possible to ground the charge by dragging a chain in the manner of gasoline trucks, but tire engineers are seeking a method to make tires conducting by impregnating them with copper or graphite.

Sees Equipment Market Broadening

J. W. SHEPERDSON, vice president, Morgan Construction Co., Worcester, Mass., joins officials of other large equipment manufacturers and designers (STEEL, Jan 28, p. 10; Feb. 4, p. 14) in appraising the market for new and more economical equipment in the iron, steel and metalworking industries as a large one. Says Mr. Sheperdson.

"Steel companies for the past four years have kept us very busy preparing layouts and estimates for the improvement of existing mills which have outlived their usefulness. It is generally recognized that new capacity in the steel trade is not required, but it is equally well known that many rolling mills must be replaced with more up-to-date equipment.

"Tremendous strides in the construction of continuous mills have been made to the end that they produce the higher type of product demanded today, that they lend themselves to more elastic operation and to more diversification, and finally that they improve conversion cost which has a tendency to mount due to labor rate increases and the regulation of working hours.

"It is interesting to observe that during the lull in the building of new mills in the United States a spurt in mill building has taken place in

J. W. Sheperdson

Great Britain where the steel companies, spurred on by tariffs now imposed on steel products, have taken steps to improve and increase their facilities. They are finding no lack of capital to finance worthwhile projects.

"The world is closely linked in an economic sense and the recent steel production rate in Great Britain of 87 per cent of their record for all time is bound to be reflected here just as soon as that intangible factor, 'confidence,' asserts itself on this side as it has already done across the water.

"In expectation of a revival of business in general and of ours in particular, we have been devoting ourselves during these depression years to perfecting our product. With the advent of real interest in new mills, we will be in a position to offer the equipment which the times demand.

"Our forecast, based on evidence in our line, is that for 1935, and for several years to come a great deal of mill replacement will be carried out by the steel companies."

Industrial Men in the Day's News

Arthur D. Morris, New President, Bayonne Bolt Corp.

For 23 years he has been active in the bolt and nut industry, with one company and its predecessors.

Starting in sales work, he later became treasurer, eastern sales agent and later vice president.

He has taken part in proceedings of the bolt and nut industry's trade association for a number of years

ARTHUR D. MORRIS, recently elected president (STEEL, Feb. 11) of the Bayonne Bolt Corp., Bayonne, N. J., has been affiliated with that company since 1912, when he first became associated with the industry. He served at the beginning in various minor capacities and in 1915 joined the sales force of the company.

In 1919 he became assistant treasurer, and when the company, which was then known as the Bayonne Bolt & Nut Co., became affiliated with the American Bolt Corp. in 1923, he was appointed eastern sales agent for the latter corporation. Following the dissolution of the American Bolt Corp. in 1926, he became vice president of the Bayonne Bolt Corp., holding this position until his recent election to succeed Ernst L. Rupf, who retired to become mechanical engineering consultant.

Mr. Morris was born in Newark, N. J., in 1889. He has long been active in the American Institute of Bolt and Nut Manufacturers and at one time was a member of the Institute's executive council.

□ □ □

L. A. Shea, former district manager for Ohio of the Hevi Duty Electric Co., Milwaukee, has been appointed district manager for Illinois and the northern half of Indiana, with offices at 205 West Wacker drive, Chicago. He will have charge of the company's service and sales agency on electric heat treating furnaces.

S. A. Silberman, for several years subagent for the company, is now in charge of the Indianapolis office, with territory including Kentucky and southern half of Indiana. Claud S. Gordon Co., Indianapolis, has been designated district representative for the company.

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Frank A. Livingston, formerly vice president and treasurer of the Ralston Steel Car Co., Columbus, O., has been named president and general manager, succeeding the late Francis E. Symons, who died Jan. 23.

Leon C. Roy, former secretary and assistant treasurer, has been named secretary-treasurer.

Mr. Symons has been associated with the Ralston company for 28 years, since 1921 as president. He was also president of the Ralston Scales Corp.

□ □ □

H. C. Guild has been appointed manager of the eastern regional division of the Vilter Mfg. Co., Milwaukee, refrigerating machinery, air conditioning equipment and other lines. He was formerly with the A. M. Byers Co., Pittsburgh, as consulting engineer and associated sales manager. He has designed numerous types of evaporators and condensers, and the Vilter company has arranged to build some of his equipment on which patents have been issued or are pending.

H. C. Guild

Charles Wesley Sr.

Who as noted in STEEL for Feb. 11 has been elected president of the Wesley Steel Treating Co., Milwaukee, for the twentieth consecutive time

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J. I. Baker has been elected president and general manager of the Safety Grinding Wheel Machine Co., Springfield, O. He has also been re-elected to the board of directors, and to the code authority of the grinding wheel industry.

George E. Vance has been elected vice president and treasurer of the company. H. G. Weinland has been named secretary.

□ □ □

C. Hix Jones, since 1926 associated with the American Rolling Mill Co. and until recently with the Detroit sales office of that company, has joined the Youngstown Sheet &

Tube Co.'s sales office at Detroit.

□ □ □

George C. Stone, New York, active in the chemistry and metallurgy of zinc, will receive the James Douglas medal of the American Institute of Mining and Metallurgical Engineers at the annual dinner of the institute in Commodore hotel, New York, this Wednesday.

James MacNaughton, president and general manager of the Calumet & Hecla Consolidated Copper Co. and past president of the Lake Superior Mining institute, will receive the William Lawrence Saunders gold medal at the same time.

Francis M. Rich, Republic Steel Corp., Youngstown, O., will be recipient of the J. E. Johnson Jr. award, given annually to engineers under 35 who have distinguished themselves in iron and steel work.

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Henry D. Miles, president of the Buffalo Foundry & Machine Co., Buffalo, has been appointed industry's representative on the second panel of the New York state NRA adjustment board, with headquarters in Buffalo.

□ □ □

Harold Phillips has been appointed chief of the engineering and research staff of Hastings Mfg. Co., Hastings, Mich., manufacturer of piston rings.

□ □ □

R. C. Overstreet, previously associated with the Mueller Furnace Co., Milwaukee, and the Nash Motors Co., Racine, Wis., has been appointed purchasing agent for the Young Radiator Co., Racine.

□ □ □

Norman L. Pearson, assistant equipment sales manager of All-Steel-Equip Co. Inc., Aurora, Ill., manufacturer of steel shop and office equipment, and electrical wiring specialties, has been apointed sales manager of the industrial division.

□ □ □

C. W. Heppenstall, president of the Heppenstall Co., Pittsburgh, was honored at an anniversary dinner in the William Penn hotel, Pittsburgh, Feb. 16, marking his forty-second year with the company. Fifty employes and associates attended.

□ □ □

R. W. McCandlish, formerly vice president and sales manager of the Standard Silica Co., Chicago, has become associated with the Research Corp., New York, at its Chicago office, 59 East Van Buren street. In his new position, he will sell the company's dust arrestors.

□ □ □

John M. Simpson has been elected a director of A. M. Castle & Co., Chicago, to succeed Leonard J. Quetsch. Mr. Quetsch, formerly secretary of the company, has been made a vice president.

A. C. Cox, formerly treasurer, now is first vice president and treasurer. Fred C. Flossi, formerly assistant secretary and assistant treasurer, has been elected secretary. John B. Robbins has been made assistant secretary and assistant treasurer.

Irving N. Smith

Who as noted in STEEL Feb. 11 has been appointed assistant general sales manager for the Central Iron & Steel Co., Harrisburg, Pa.

Died:

WILLIAM D. CRAWFORD, 78, at one time prominent in the steel industry in the Pittsburgh and Steubenville, O., districts, and a former president of the LaBelle Iron Works, Steubenville, O., now part of Wheeling Steel Corp., in Miami, Fla., Feb. 10. He retired in 1918.

□ □ □

J. Lee Rodgers, 57, vice president and treasurer, National Valve & Mfg. Co., Pittsburgh, Feb. 10.

□ □ □

U. U. Carr, general superintendent, Diamond Machine Co., Pittsburgh, in Monongahela, Pa., Feb. 10.

□ □ □

William J. Fichter, 53, vice president, Taylor-Fichter Steel Construction Co., New York, in Tonawanda, N. Y., Feb. 8. His company holds contracts for erection of towers for the new Triboro bridge in New York.

□ □ □

Priestly Toulmin, 71, formerly mining engineer for the Sloss-Sheffield Steel & Iron Co. and past president of the Lehigh Coal Co., Birmingham, Ala., in that city, Jan. 24.

□ □ □

Frederick W. Vilmar, 53, vice president and treasurer of the American Stamping Co., Cleveland, in that city, Feb. 13, after a long illness. He was a co-founder of the company.

Motor Repairs Recovery Sign

AN INCREASING number of inquiries and orders for rewinding motor armatures used in strip and sheet mill motors is regarded by electrical manufacturers as a harbinger of recovery. This demand is especially noticeable in the flat rolled steel industry. Most inquiries ask for an increased efficiency of 50 per cent.

Edgcomb Heads N.Y. Chapter Of Warehouse Association

Harry L. Edgcomb, president, Edgcomb Steel Corp., Newark, N. J., was elected president of the New York chapter, American Steel Warehouse Association Inc., at a two-day meeting at New York, Jan. 22-23. Organization of the New York chapter with the adoption of by-laws and constitution tying in with the national association replaces the former New York district association. Approximately 40 warehouse distributors were represented.

The New York chapter will function throughout the Metropolitan area, including Westchester, north to Peekskill; northern New Jersey to Monmouth county, all of Long Island, but includes no warehouse distributors in Connecticut, the latter being included in a separate district chapter. Other officers elected:

H. B. Royer, National Bridge Co., Long Island City, N. Y., and Walter S. Ganong, Edgar T. Ward's Sons Co., Newark, vice presidents; Charles Kramer, Scully Steel Products Co., Newark, secretary, with the following directors: Lester Brion and P. D. Hager, Peter A. Frasse & Co., New York; M. W. Faitoute and P. F. Benedict, Faitoute Iron & Steel Co., Newark; Joseph Roberts, Edgcomb Steel Corp., Newark; B. F. McCreary, Carroll-McCreary & Co., Inc., Long Island City, N. Y.; H. B. Bessler and A. E. Jordan, Joseph T. Ryerson & Son Inc., Jersey City.

The annual meeting of the chapter will be held in April, the above officers holding office until at least that period

Philadelphia Also Organizes

Organization of the Philadelphia chapter of the American Steel Warehouse association has been effected with appointment of Arthur B. Mead, vice president of Peter A. Frasse & Co., as president, and James J. Collins, of L. Norris Hall Inc., secretar-treasurer.

EDITORIAL

We Need Facts To Harness Technological Progress

TO ANYONE who has a fair knowledge of the methods employed in the automobile industry, the report of the special Henderson committee will appear on the whole to be a moderate and unbiased statement of the facts.

The principal findings are that labor unrest exists to a degree higher than warranted by the depression, that the foremen's power and the gap between the worker and the executive are important causes of labor unrest, that competition has spurred the speed-up "beyond human capacity to produce day by day," that workers are considered old at 40 years, that hourly wages are high but annual income low, that an espionage system exists in most of the plants and that the technological improvements in production during the past five years have been extraordinary and in themselves present problems of great importance.

The report does not imply that these conditions are uniform throughout the industry. On the contrary, it shows that some companies have done much better than others in maintaining stable conditions of employment. For instance, Packard Motor Co. was reported to have employed 92.8 per cent of its employes for at least 40 weeks of 1934. More than 53 per cent of its employes averaged better than $1200 in annual income. In contrast to this record, it was shown that only 30 per cent of the employes of another company were employed for 40 weeks or more during the year, and only 23 per cent average $1200 or more in annual income.

Industry—Not Government or Unions—Should Lead Reform Movement

Again, there is a wide divergence among companies in the handling of their employment problems. Although the Henderson report does not go into this subject thoroughly, it is well known that espionage is carried to extremes by some employers and not practiced at all by others. Several companies have unsavory reputations for encouraging hard boiled treatment of employes by foremen and for using other tactics which are conducive to labor unrest. In contrast, there are companies which have won reputations as "good employers."

However, the conditions, while better in some plants than others, are such that the industry itself—rather than the national government, the professional labor unions or other outside interests—should take the initiative in striving for immediate remedy and improvement. While the problem directly concerns the automobile manufacturers at the moment, it has much broader application. It presents a challenge to every branch of American industry in which the principles and methods of mass production are or will be practiced.

Much of the problem is due to the fact that technological progress, of which the assembly line is a symbol, has been so rapid in recent years that our ability to adjust human relationships to its requirements has been overtaxed. While engineers, employers, government experts, social workers and others have given much thought to the problem, the solution still is remote.

Blame Cannot Be Charged Solely to Mechanization of Auto Plants

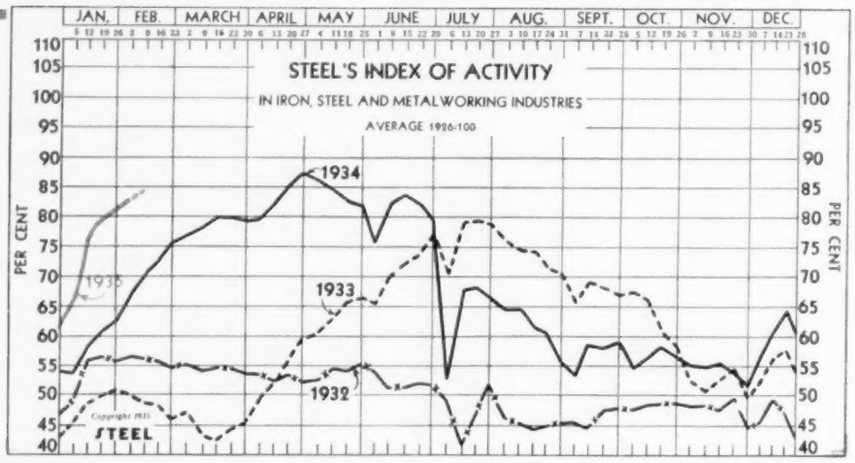
One of the principal difficulties is that we do not know enough of the facts. We read in the Henderson report that automobile body framing, which cost $3 in 1929, costs only 30 cents today. If we assume, as many persons will, that this means technological progress was largely responsible for this reduction and that it was achieved to the detriment of employment, we probably will be in error. If we could examine every factor pertinent to this reduction in cost, doubtless we would find that the change from wood to steel in body construction involved a double shift of employment. First was the transfer of employment from the lumber and woodworking to the steel and metalworking industries. Second was the shift from laborious finishing operations in the body plant to the production of a more highly finished product at the sheet mill.

Until we know more accurately the exact effect of technological progress in terms of man hours in every affected branch of industry, we shall be seriously handicapped in working out the complicated social problems of this period.

Of one thing we can be reasonably sure. That is that an industry which makes efficient use of machinery should be in a position to maintain better conditions of employment than an industry which is not highly mechanized. The cost-saving features of machinery should enable the automobile industry not only to share liberally with its employes but also to provide a substantial degree of stability of employment.

That machines have not afforded these benefits more extensively in the motor car industry indicates a maladjustment calling for early remedy.

THE BUSINESS TREND



STEEL'S *index of activity in the iron, steel and metalworking industries gained 1.2 points to 83.0 in the week ending Feb. 9.*

Week ending	1934	1933	1932	1931
Dec. 8	56.8	52.6	46.6	52.9
Dec. 15	60.6	56.0	49.3	53.1
Dec. 22	64.4	58.0	46.9	52.3
Dec. 29	60.8	53.7	42.9	46.8
	1935	1934	1933	1932
Jan. 5	65.4	53.6	45.3	48.8
Jan. 12	73.8	58.1	48.6	55.8
Jan. 19	78.1	60.9	49.8	56.2
Jan. 26	79.5	62.3	50.8	55.8
Feb. 2	81.8†	66.9	49.9	56.2
Feb. 9	83.0*	70.7	48.7	56.0

†Revised. *Preliminary.

Uncertainties Again Check Pace of Improvement

BUSINESS has lost some of its buoyancy during the past week or ten days. Fair headway still is being maintained in industrial activity generally, but here and there one finds evidence that the pace has slackened appreciably.

The easier trend is reflected noticeably in the weekly rates of steelmaking operations. After nine consecutive weeks of steady improvement, in which operations advanced from 28 to 54½ per cent of capacity, the rate for the week ending Feb. 9 failed to exceed that of the previous week and the rate for last week showed a slight recession.

On the other hand, automobile production still is expanding, and for the principal manufacturers the peak in the number of assemblies probably will not be reached until March, or later. Sentiment in motordom continues strong, but a faint undercurrent of apprehension that the optimism which attended the show season was overemphasized is beginning to manifest itself.

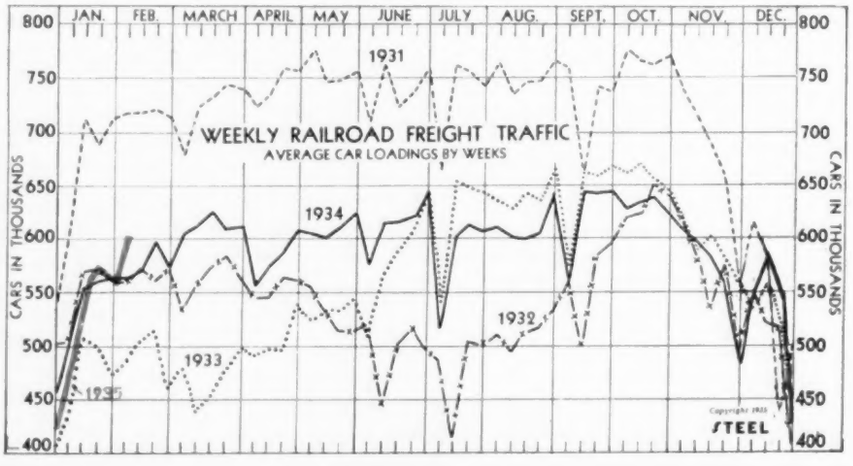
Considering the marked increase in revenue car loadings in the preceding week, the slight gain in the week ending Feb. 9, which is indicated by the early reports of the principal carriers, is encouraging. Starting the year at a slight disadvantage in comparison with 1934 figures, freight traffic has wiped out the margin and now has a comfortable edge over the corresponding volume of a year ago.

Electric power output, which has been soaring high about last year's levels, showed a minor gain in the week ending Feb. 9.

Pending Gold Decision and Commodity and Employment Difficulties Abroad Are Factors

In business circles, postponement of the decision on the gold clause is considered one of the factors responsible for the slackening of activity. Another development which probably is conducive to more deliberate action in the consideration of certain projects is the epidemic of failures in pepper and shellac in London, coupled with disconcerting increases in unemployment in England and on the continent. The behavior of business following the gold decision should give a clue to the strength or weakness of the present drive for recovery.

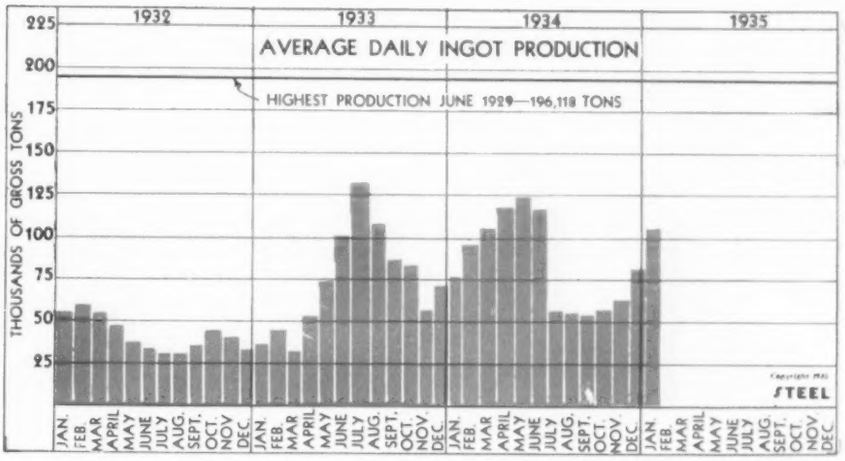
1935	
Feb. 2	598,164
Jan. 26	555,768
Jan. 19	562,955
Jan. 12	553,675
Jan. 5	498,073
1934	
Dec. 29	425,120
Dec. 22	547,895
Dec. 15	579,935
Dec. 8	551,011
Dec. 1	488,118
Nov. 24	561,313
Nov. 17	584,525
Nov. 10	594,932
Nov. 3	612,457



1934	
Feb. 3	565,401
Jan. 27	563,100
Jan. 20	561,902
Jan. 13	557,266
Jan. 6	500,813
1933	
Dec. 30	454,765
Dec. 23	531,464
Dec. 16	559,419
Dec. 9	541,992
Dec. 2	499,596
Nov. 25	585,738
Nov. 18	602,708
Nov. 11	583,073
Nov. 4	614,136

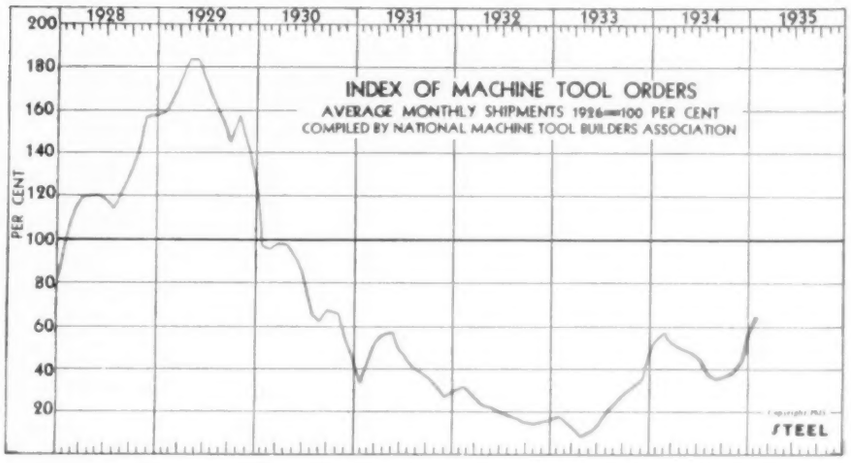
Ingot Production Gains 40 Per Cent

	1935	1934	1933
		Gross Tons	
Jan.	104,969	73,007	39,110
Feb.	.....	90,965	44,709
March	.....	102,275	33,268
April	.....	115,912	53,817
May	.....	124,177	73,201
June	.....	116,006	98,632
July	.....	58,912	126,734
Aug.	.....	50,503	106,058
Sept.	.....	50,068	87,811
Oct.	.....	54,151	80,188
Nov.	.....	61,126	58,507
Dec.	.....	77,664	71,944



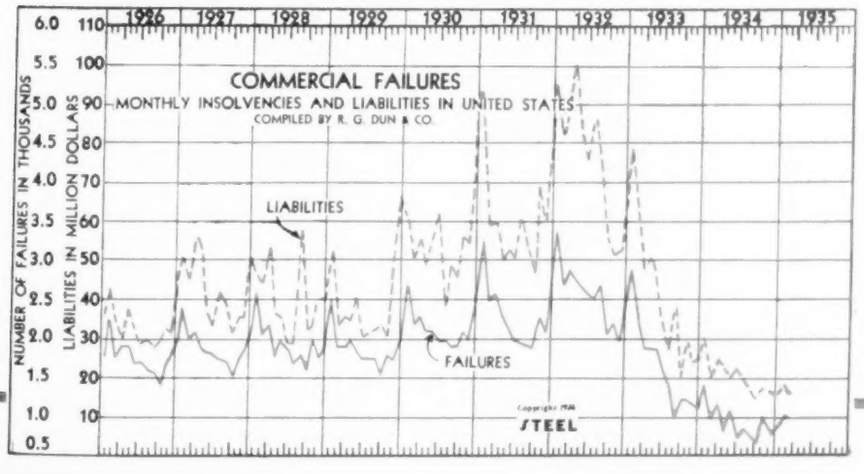
January Machine Tool Index Up Sharply

	1935	1934
Jan.	61.3	56.5
Feb.	.....	58.2
March	.....	50.9
April	.....	48.5
May	.....	46.8
June	.....	42.6
July	.....	38.6
Aug.	.....	37.1
Sept.	.....	37.4
Oct.	.....	40.5
Nov.	.....	44.2
Dec.	.....	54.1



	1933	1932
Jan.	18.3	32.8
Feb.	15.2	30.4
March	11.1	23.9
April	8.3	20.6
May	10.6	20.8
June	15.5	21.7
July	22.4	18.7
Aug.	27.9	16.8
Sept.	30.9	15.3
Oct.	33.3	15.7
Nov.	38.0	16.4
Dec.	51.0	17.6

Business Failures and Liabilities Continue Low



	Failures		Liabilities	
	1935	1934	1935	1934
Jan.	1,184	1,364	$18,823,697	$32,905,428
Feb.	.....	1,049	.....	19,444,718
Mar.	.....	1,102	.....	27,227,511
Apr.	.....	1,052	.....	25,786,975
May	.....	977	.....	22,560,835
June	.....	1,033	.....	23,868,293
July	.....	912	.....	19,325,517
Aug.	.....	929	.....	18,459,903
Sept.	.....	790	.....	16,440,147
Oct.	.....	1,091	.....	19,968,448
Nov.	.....	923	.....	18,349,791
Dec.	.....	963	.....	19,910,610

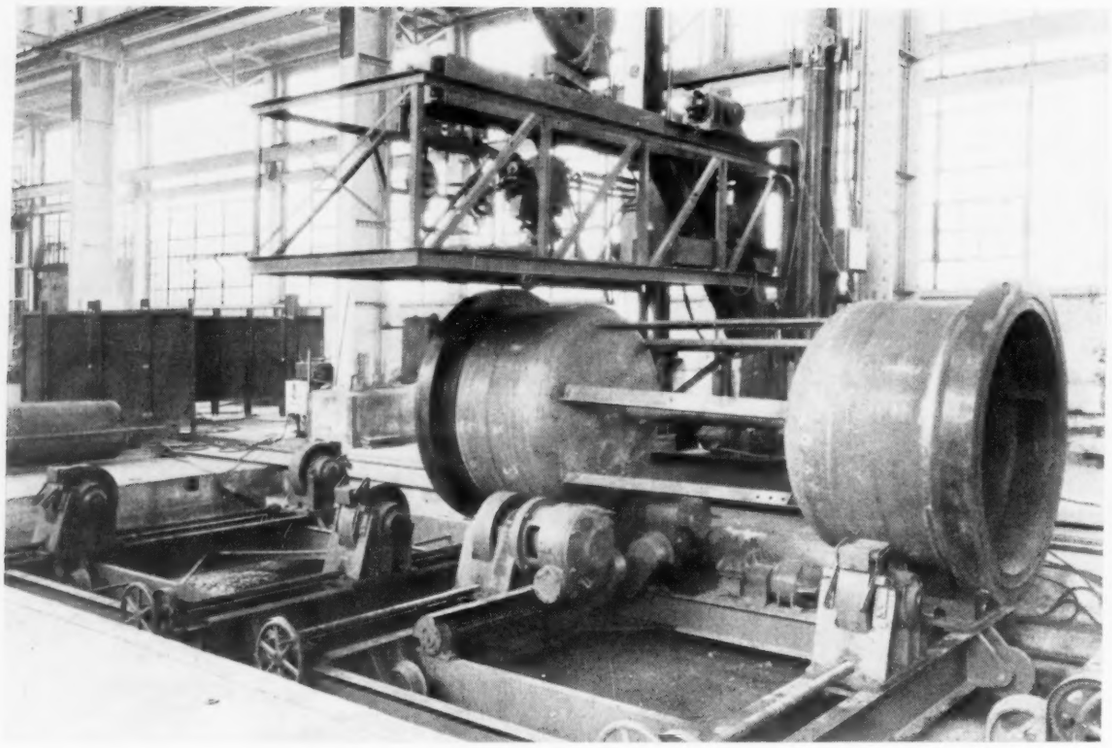


Fig. 1—Automatic alternating-current arc welding machine equipped with motor-driven rolling device

AUTOMATIC A. C. ARC WELDING

BY O. A. TILTON
General Electric Co.

AUTOMATIC welding of Class I pressure vessels with alternating current is not new. It is only recently, however, that automatic equipment, transformers, electrodes, and procedure have become generally available to industry. Alternating current welding has been known and practiced fully as long as direct current welding, but its application has been limited. The reason is that until heavily coated electrodes were available and the welding of unfired pressure vessels was officially sanctioned by the A.S.M.E. code, the field in which alternating current shows up to best advantage was practically nonexistent. It is probably correct to say also that an unfortunate prejudice against alternating current was established in American engineering circles in those earlier days of welding, and this, no doubt, prolonged the time until proper application became recognized.

Metallurgically and physically, it appears that a prerequisite to Class I welding is the use of heavily-coated electrodes, sometimes known as the shielded-arc type. This latter term appears to have originated with the gaseous shielded arc developments of Dr. P. P. Alexander and Prof. Elihu Thomson of the General Electric Research Laboratories in 1924. Shielded arc electrodes form a gaseous envelope around the arc, excluding the detrimental elements, oxygen and nitrogen, of the atmosphere, from contact with the molten metal as it passes through the arc. They also deposit a slag coating on top of the weld metal, further protecting it during solidification, as well as contributing somewhat of a grain refining function. In some cases, the heavy coating of the rod includes alloying elements. With shielded-arc electrodes, it is possible to obtain deposited weld metal equal and often superior in many of its properties to rolled plate parent stock.

Controlled welding of the type just mentioned eliminates many of the uncertainties inherent in bare wire welding which become excessively troublesome when currents much in excess of 250 amperes are used. With

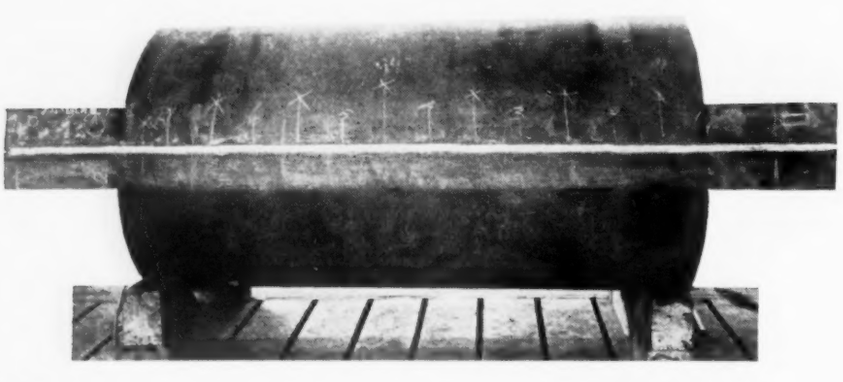


FIG. 2—Typical arc welded pressure vessel ready for X-ray examination; the lead identification markers have been placed, but test plates have not been removed

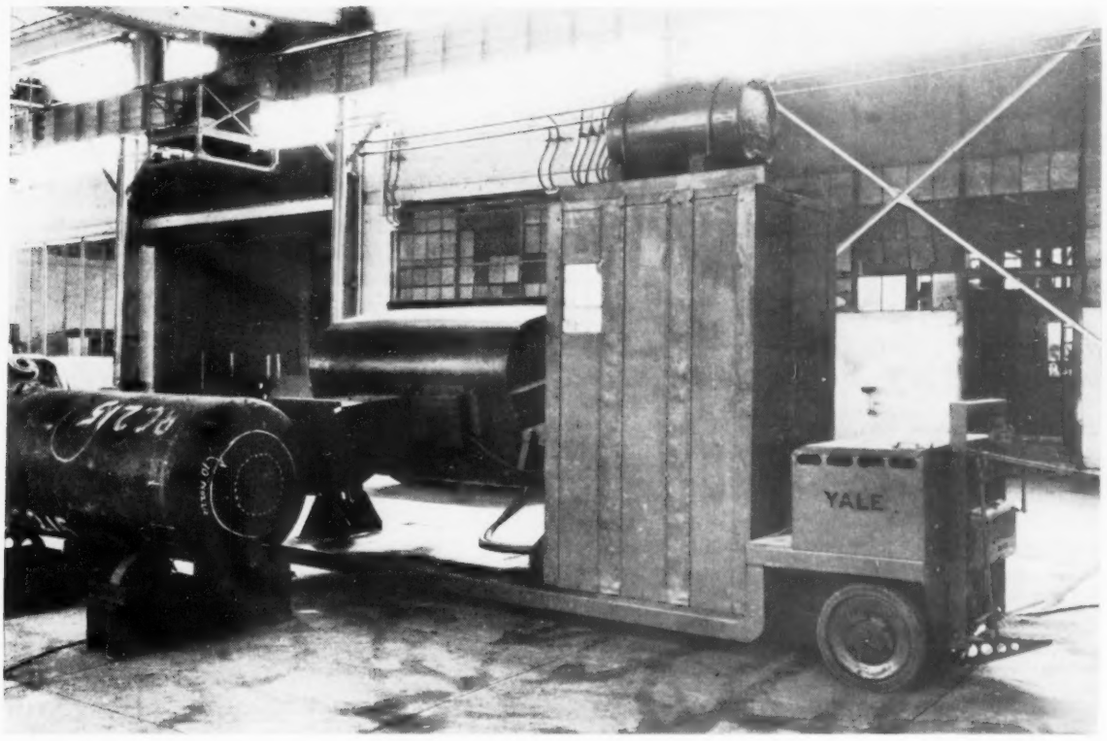


Fig. 3—An arc welded pressure vessel being submitted to X-ray examination by a portable equipment

OF CLASS I PRESSURE VESSELS

these factors removed, it was natural to go to higher welding currents with their increased electrode melting rates and at the same time to obtain the required penetration because of the concentration of heat by the electrode coatings.

Excellent work has been done with shielded-arc electrodes and direct current, but there still has remained a troublesome factor, magnetic blow, the effects of which are to slow down production rates and increase unit costs. Although it is possible to counteract largely the effects of magnetic blow by a proper arrangement of direct-current solenoid magnets, it has appeared impossible to do anything about magnetic blow by changes in electrode characteristics. Since the use of alternating current naturally would avoid this trouble to a considerable degree, it remained for metallurgists to develop electrodes which would operate satisfactorily with alternating current.

It is seen, therefore, that electrode development is largely responsible for making practical the use of alternating current in the heavy current field of pressure vessel welding. There appears to be but one advantage—the practical elimination of magnetic blow—to be gained by using alternating current, but that is a very important one from the standpoint of increased speed, uniform high quality results and reduced unit costs.

Alternating current seems to have an inherent characteristic which requires certain closely defined electrode characteristics. It has been found, therefore, that electrodes formerly satisfactory for direct current are not necessarily successful with alternating current; on the other hand, it is not generally known that properly designed alternating current electrodes are likewise good when they are employed with direct current.

To make the story complete, we must state the disadvantages of alternating current. In this connection,

FIG. 4—This illustration shows an arc welded pressure vessel with the fittings being attached by hand welding. Alternating current also is employed for hand welding

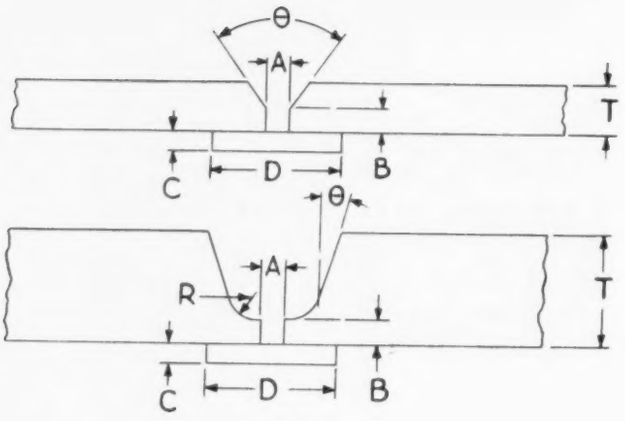


FIG. 5 (Top)—Bevel or groove for plate thicknesses up to ½-inch inclusive

Fig. 6 (Bottom)—The same for plates from ½ to 1½ inches thick. Complete specifications are given in Table I

however, it should be pointed out that experience has shown the elimination of magnetic blow in many cases to be of so great importance as to outweigh these disadvantages. Disadvantages are as follows:

1. It is impractical to use bare or lightly coated electrodes with alternating current because with them it is difficult, if not impossible, to make as good a weld as when using direct current.

2. Alternating current welding is now only practicable with single phase and inherently involves either low power factor or low efficiency. The two former, generally considered as undesirable load characteristics by power companies, sometimes involve penalties unless power factor and phase distribution corrective equipment is also installed.

3. The first cost of alternating-current equipment is no lower than direct-current equipment, and may be higher, when corrective equipment is required.

4. There is a psychological element involved in the use of alternating current which is probably inherited from the earlier days when alternating current equipment was less reasonably designed. This is a fear of shock on the part of welding operators. This is called psychological because it is actually unjustifiable since present day application of alternating current tends toward the use of such low values of secondary voltage as to make the danger practically nonexistent. Voltage reducing auxiliary attachments eliminate this objection but of course add certain costs which are a necessary evil, although possibly of a temporary nature only.

High-Reactance Transformer

Equipment for automatic alternating current welding includes a transformer unit which is essentially a high-reactance transformer with a means of adjusting reactance for the purpose of current adjustment. The reactance is for the purpose of reducing the secondary voltage from the striking or no load voltage down to that required for the arc. These values are at present approximately 80 volts and may even be as low as 65 volts at no load, and 40 volts at the arc. Besides the switches or other means of current control, each unit has a voltmeter, an ammeter and enclosed primary and secondary terminal lugs. Due to the service for which they are intended, these units are necessarily of the air-cooled type and for stationary mounting. Voltage and current reducing attachments when used are mounted with suitable enclosures on the transformers.

Automatic arc welding head, to justify its name as such, is a motor-driven wire feeding device, with electrical control which causes automatic maintenance of the arc length irrespective of variations in electrode melting rate and irregularities in the contour of the work. Such devices also are provided with means of conducting the welding current to the metallic electrode at a point which remains at a constant distance from the arc at all times, thus maintaining a uniform voltage drop in that part of the electrode itself. In automatic welding, it is always preferable to use electrode in continuous lengths from a reel. Unless this is done, one of the important economies of this process is lost, namely the saving of the loss of electrode material in short ends that cannot be consumed. With the proper combination of a well-designed electrode and automatic head, no difficulty is encountered in feeding any size and type of shielded-arc electrode which can be reeled without destroying its coating.

Suitable electrodes for automatic alternating current welding of Class I pressure vessels have, beside the necessary arcing characteristics, a high gas producing coating and one which provides complete slag coverage for the weld. The slag is easily removed from the weld metal after it has cooled. It is understood, of course, that the resultant weld deposit meets the physical and X-ray requirements for Class I pressure vessels with the minimum expenditure of effort and time.

For use with the automatic arc welding machine, the heavily-coated shield-arc electrode of the General Electric Co. is provided in several varieties as required by the material and process involved. It is covered

THE accompanying article, discussing fundamental considerations in alternating-current arc welding and describing a large and successful installation, is prepared from a paper presented before a recent meeting of the New York section of the American Welding society. The author, O. A. Tilton, is associated with the industrial engineering department, General Electric Co., Schenectady, N. Y.

Table I

Typical Data for A.C. Arc Welding

Plate Thickness T Inches	Edge Preparation Fig. No.	θ Degrees	A Inches	B Inches	C Inches	D Inches	R Inches	Number of Passes
1/4	5	70	1/8-5/32	1/8	1/8	1 1/4	—	3
3/8	5	70	1/8-5/32	1/8	1/8	1 1/4	—	4
1/2	5	70	1/8-5/32	1/8	1/8	1 1/4	—	6
5/8	6	70	1/8-5/32	1/8	1/8	1 1/4	—	7
3/4	6	7 to 9	1/8-5/32	1/8	1/8	1 1/4	5/16	8
7/8	6	7 to 9	1/8-5/32	1/8	1/8	1 1/4	5/16	9
1	6	7 to 9	1/8-5/32	1/8	1/8	1 1/4	5/16	12
1 1/8	6	7 to 9	1/8-5/32	1/8	1/8	1 1/4	5/16	13
1 1/4	6	7 to 9	1/8-5/32	1/8	1/8	1 1/4	5/16	15
1 3/8	6	7 to 9	1/8-5/32	1/8	1/8	1 1/4	5/16	16
1 1/2	6	7 to 9	1/8-5/32	1/8	1/8	1 1/4	5/16	16

by a fabric coating heavily impregnated with fluxing ingredients. This securely adheres to the base wire, because of the properties of the ingredients used. A colored spiral tracer thread is used to still further prevent damage to the coating in handling, as well as a means of identifying the various types of rod.

To apply the process and equipment described to Class I pressure vessels, requires certain fixtures for holding the work in position and for traversing the arc across the work, or vice versa, as well as material handling devices. These vary with the plant layout and are generally built to the particular specifications accompanying each installation. They are, however, all based on the well-known principles of rolling devices for circumferential seams and travel carriages for longitudinal seams.

The Foster Wheeler Corp., Carteret, N. J., is now manufacturing weld fabricated pressure vessels under the A.S.M.E. code for Class I unfired pressure vessels. Alternating-current automatic arc welding is used exclusively for all seams excepting tank fittings, which are applied by hand welding with alternating current. This installation has been in successful production operation since the latter part of May, 1934, and has turned out a large tonnage of Class I vessels.

Description of Equipment

This company's shop is approximately 400 feet long and 75 feet wide, and is equipped with seven bridge cranes for material handling. Three-phase, 60-cycle primary power is purchased from a public untility at 26,400 volts and a bank of six 150-kilovolt-ampere transformers step this down for the 220-volt, 3-phase, 60-cycle shop supply. Direct current for variable-speed drives such as the automatic welding machine, the travel carriage motors, and the rolling device drives, is furnished by a 220-kilowatt, 275-volt, direct-current generator, driven by a 260-horsepower synchronous motor.

Most of the plate stock is purchased from the mill as required, but a small stock of light-gage plates is kept on hand. Often it is found desirable to have the plate edges machined at the mill to the specified groove. All other stock can be planed on a standard-type plate planer, 38 feet long, which will handle at least 4-inch thickness without difficulty. Shells from 33-inch minimum diameter up to the largest which can be shipped, 14-feet diameter, can be rolled on the 200-ton rolling equipment. A hydraulic pressure-brake takes care of the preliminary braking of the plate edges.

Hand welding stations are located at convenient points for tack welding, which is done with 3/16-inch diameter, General Electric type W-20 electrode, at approximately 150 amperes and 23 volts.

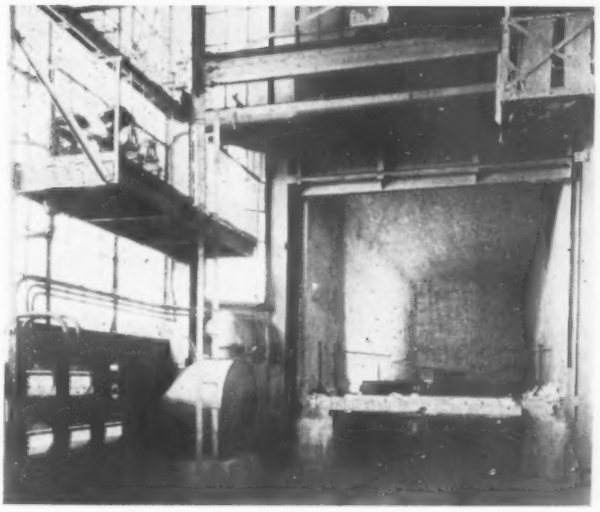


FIG. 7—Here is shown the butane gas fired furnace in which welded pressure vessels are annealed after X-ray examination is complete. This furnace will accommodate vessels up to 14 feet diameter and 30 feet long

The shells then are taken to the automatic welding machine, located in the center of the building, as shown in Fig. 1. This consists of a travel carriage assembly mounted on upper and lower supporting rails, with a length of travel of 70 feet. Alongside this track is a pit 65 feet long, approximately 12 feet wide and 3 feet deep in which are four units for holding the vessels. Two of these units and a portion of the pit are shown in the illustration.

Each alternate holding unit is equipped with a motor-driven rolling device and the other units are provided with idling rollers. The motor-driven units are synchronized by a Ward-Leonard control. For longitudinal seams, the rolls remain stationary and the travel carriage moves along the seam, whereas for circumferential seams, the travel carriage remains stationary and the shells are rolled under the arc. Each device is adjustable as to speed, from 2 to 15 inches per minute. Vessels from 2 to 14 feet in diameter and up to 70 feet long can be handled on this equipment.

Edge Bevel Is Important

The bevel or groove for plate thicknesses up to and including ½-inch is shown in Fig. 5 and for all heavier plates in Fig. 6. Experience has proved that the angle of V bevel and of the sides of the U groove are important factors in obtaining successful results. Wider angles add nothing to quality and increase costs

(*Please turn to Page* 64)

Table II

Specifications for Plate Edge Preparation

Plate Thickness Inches	Description of Passes	Pass No.	Electrode Diameter Inches	Welding Current Amp	Arc Voltage	Approx. Welding Speed Inches per Minute	Electrode Consumption Pounds per Minute	Oscillation	
								Approx. Amplitude Inches	Frequency Osc/min.
½"	Bottom of Groove	1	5/32	130	25	7½ to 8	.045	None	
		2	3/16	175	28	6	.074	None	
		3	3/16	175	28	5	.074	1/32	
		4	1/4	275	30	4¾	.13	1/16	
	Hand Backing Beads	5	1/4	275	30	4½	.13	1/16	
		6	1/4	275	30	4¼	.13	3/32	
1½"	Bottom of Groove	1	3/16	175	28	7½ to 8	.074	None	
		2	3/16	175	28	6	.074	None	
		3	1/4	380	38	5	.20	1/32	36
		4	1/4	380	38	4¾	.20	1/16	36
		5	1/4	380	38	4½	.20	3/32	36
		6	1/4	380	38	4¼	.20	1/8	36
		7	1/4	380	38	4	.20	5/32	36
		8	1/4	380	38	3½	.20	3/16	36
		9	1/4	380	38	3½	.20	7/32	36
		10	1/4	380	38	3½	.20	1/4	36
		11	1/4	380	38	3¼	.20	9/32	36
		12	1/4	380	38	3¼	.20	5/16	36
		13	1/4	380	38	3	.20	11/32	36
	Hand Backing Beads	14	1/4	380	38	3	.20	1/16	
		15	1/4	380	38	3	.20	3/32	
		16	1/4	370	38	3	.16	1/8	

Preparing Machine Elements For Metal Spray Coating

BY CHARLES BOYDEN, Chief Engineer,
Metallizing Co. of America Inc., Los Angeles

TO THOSE who are not familiar with the expression, it may be stated that a "machine element" is one of the many parts of a machine; in other words, one of the elements which go to make up the whole machine. Thus, pistons, connecting rods, crankshaft and similar parts are the elements in an automobile engine.

The metal spraying or metallizing of machine elements is really a business within itself, and the perfection of this type of coating is of importance in practically all engineering fields. Quick, permanent and inexpensive repairs now can be made which heretofore were in many cases impossible. Repairs which necessitated the dismantling of massive machinery and took weeks to accomplish, can now be carried out in a few days at low cost and without completely tearing down the machinery in question. Of particular interest is the reclaiming or salvaging of obsolete parts which the manufacturer may have discontinued making.

This type of coating is by no means limited to simple repairs. Sleeves of metals resistant to various types of corrosion can be sprayed in the center of ordinary shafting, avoiding the necessity of buying a complete shaft of some expensive material when only a few inches of the shaft is subjected to corrosion. Hard surfaces can be applied to soft surfaces and soft surfaces can be applied to harder bases.

Overcoming Difficulties

It is only in the last two or three years, however, that complete success has attended efforts made to develop this type of metal spray coating. Early attempts as a rule failed and coatings which stood up were exceptions; but today, failures are uncommon and when they do occur they can be traced to some peculiar circumstance connected with the particular application, or to the improper preparation of the surface being coated.

About 80 per cent of the success of any metal sprayed coating depends upon the surface preparation and this holds true whether the surface be flat or of a cylindrical nature such as a shaft. It is generally understood that the preparation of a surface to receive a metal sprayed coating is best accomplished by blasting with steel grit or sand. This is correct where large surfaces are to be coated but, in machine element work, where as a rule there is considerable stress or shock, a more positive bond is required and other methods should be used in preparing the surface.

In machine element work, most surfaces are cylindrical, but occasionally it is necessary to coat a flat or semiflat surface and in either case the surface should be prepared by machining whenever possible. A coating applied to a properly machined surface has a high bond strength and can be relied upon to give satisfactory service even under adverse conditions.

A Hypothetical Case

In any coating work, first consideration should be given to the purpose of the coating. Is the shaft undersize and what will be the finished size? Is the coating to resist wear primarily or is resistance to corrosion of first importance? Is grinding equipment available or must the coating be machined?

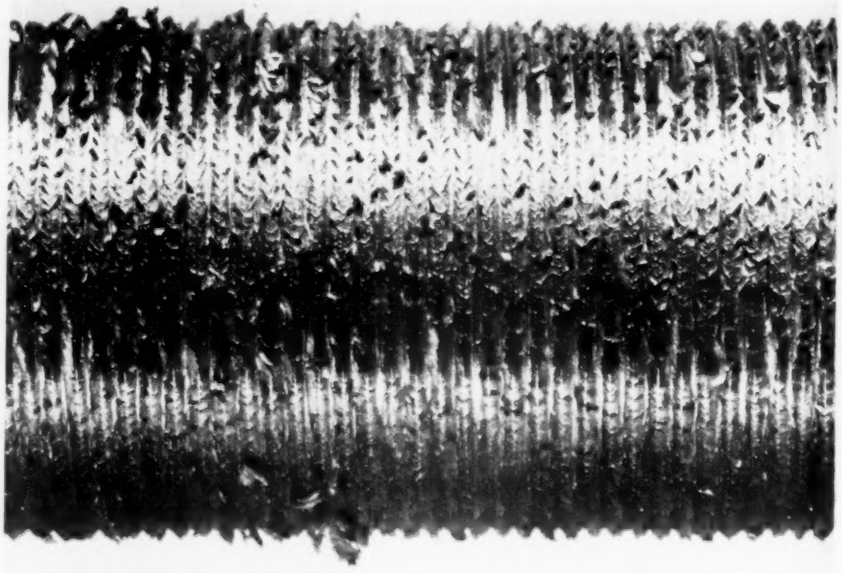
Assume the normal diameter of the shaft is 1½ inches and there is a section about 6 inches long which is corroded and about 0.040-inch (on the diameter) undersize at this point. Conditions are such that stainless steel seems best suited for the coating and available grinding facilities will be used for finishing.

Now on a shaft of this diameter the coating should be at least 0.030-inch thick over the top of the threads but in running the threads on the shaft prior to coating the tops of the threads will lift up a little so it is best to allow for this and take off 0.040-inch or 0.080-inch on the diameter. The corroded section being 6 inches long, 1 inch should be allowed at each end and the cut made 8 inches long—the net result being then, as the first step of preparation, a section 8 inches long machined 0.080-inch undersize.

Avoiding Split Coating

Often, as an extra precaution, it is advisable to make a dovetail undercut at each end of the undersize section to eliminate any possibility of the coating splitting at the end. This safety measure is not absolutely necessary but it only takes a few minutes to do it and may save trouble further on. This is done before threading.

The threading tool must be ground so it will have a sharp V point, practically straight up and down. The tool should be mounted in a strong holder so it is rigidly held up to the work, and it should be set so that the top of the tool is below the axis of the shaft as the work rotates toward the operator. Setting of the tool is of major importance and its position is best determined by trial on a sample piece. The main



Appearance of a 1½-inch shaft correctly prepared for a sprayed metal coating. Note how the threads literally are torn into the surface, providing many projections for locking the coating securely

idea is to scrape or drag a thread instead of cutting one.

The number of threads to the inch will vary with the nature of the work and also with the diameter of the piece. On a shaft of $1\frac{1}{2}$ inch diameter, about 18 threads per inch will be satisfactory. On a larger shaft, 16 threads to the inch is advisable and on a small shaft as many as 24 to the inch. It is unnecessary to go to more than 24 threads and only on exceptionally large pieces will there be any advantage in using less than 16 to the inch. The idea in all cases is to make a rough thread. A thread that is torn, that has barbs on the side, that under magnification of 100 diameters or more shows minute fissures on the surface, can be depended upon to give a strong bond.

Single, Slow Cut Advised

The threading operation requires but one cut. For best results the work should rotate slowly. The tool should be fed into the shaft to a full thread depth and the threading operation completed in one traverse of the threading tool.

After the piece is threaded, a number of small pieces will be found to have been literally torn off the sides and tops of the threads. Some of these small pieces will be found in the bottom of the threads and some will be found clinging to the top of the threads. Those in the grooves need no attention unless large but those on the top should be removed. Another tool, ground square at the end, is used and, with the work revolving, this tool is run in until it just clears the top of the threads. This final operation will knock off the pieces attached to the top of the threads and the shaft then is ready to receive the coating.

The illustration seen on Page 34 shows a shaft that has been prepared correctly. One end of the shaft is finished and ready to receive the coating and the other end is finished up to the final operation of removing the small pieces attached to the threads. Notice carefully the barbs on the sides of the threads. Underneath each one of these little barbs is a crevice into which the sprayed metal can lock.

Direct Spray Above Axis

There is little need for any extensive discussion of coating, as the technique of spraying is more or less the same for any surface. But, one point should be mentioned relative to coating machine elements. The "gun" should be so mounted that the spray is directed slightly above or below the axis of the work, depending upon the direction of rotation. The angle should be such that the spray is directed under the barbs on the side of the threads. This enables the minute metal particles to lodge in the crevices and increase the bond.

The spray gun, as a rule, is mounted on the tool post and fed slowly back and forth, across the rotating surface to be sprayed, by means of the screw feed. The speed of rotation of the work should be regulated to suit the diameter of the piece being sprayed and the traverse speed of the spraying tool will depend on the surface speed of the work. The relation of the two should be such that a good overlap is assured as the coating is applied, and when the coating is exceptionally thick the work should not be allowed to become unduly hot. However, with the machine method of surface preparation there is less danger of having a loose coating if the work piece is allowed to become hotter than normally.

Data on Grinding Wheels

Sprayed metal coatings are unlike solid metal and a grinding wheel that is satisfactory for solid material is not always suited to sprayed coatings. The writer realized about a year ago that an investigation on this point was necessary. The Norton Co., Worcester, Mass., was requested to run some tests to determine grits, speeds, traverse and the like for grinding coatings. Some shafts were prepared with high-carbon, low-carbon and stainless steel coatings and sent to the Norton laboratories. Findings were as follows:

Wheels: 18 x 2 x 5 inches, traverse 100 inches per minute.

Wheel operating speed: 6000 surface feet per minute.

Work speed: 160 revolutions per minute for 2-inch diameter shafts.

All grinding done wet.

WHEEL RECOMMENDATIONS

Stainless steel coatings—3846-K5B-crystalon.

Stainless steel coatings—3746-M-crystalon.

High-carbon steel—46-J5B-alundum.

Low-carbon steel—46-J5B-alundum.

Concentration of coolant—one part soluble oil to 40 parts of water.

It should be emphasized that all grinding must be done wet. It may be possible to do dry grinding but such a job will not be entirely satisfactory or comparable in any degree to wet grinding. Another warning is to avoid taking heavy cuts. A coating can be burned as easily as solid material, in fact more easily; to avoid this light cuts with the wheel must be taken until experience shows how heavy a cut can be taken safely.

While grinding is by far the preferable way to finish machine element work, grinding equipment often is not available, hence machining is necessary. With the exception of high-carbon coatings, practically any metal sprayed coating can be machined satisfactorily. The principal requirement is that the tools be sharp and kept sharp. Pointed cutting tools should be used, and the cut should be light.

Sprayed metal coatings can be drilled, milled and reamed but the answer as to the tools is always the same—the cutting edges must be kept sharp.

Solid Support for Iron Horse

RAILROAD BRIDGE WITH SOLID STEEL DECK: Said to be the first railroad bridge with a solid welded steel deck of interlocking-channel type, the reconstructed single track, nine-span bridge of the Reading railroad over the north branch of the Susquehanna river, between Rupert and Catawissa, Pa., was put into service a few weeks ago. The deck comprises 10-inch, 20-pound channels, placed alternately up and down and are welded with $\frac{3}{8}$-inch fillets $2\frac{1}{4}$ inches long and spaced 9 inches on centers. The deck was covered with asphalt plank upon which stone ballast and the track were placed. Compared with a solid deck of conventional slab type, this type of deck, which has been used on several highway bridges, is said to have effected a saving in the dead load of 110 pounds per square foot

Service Characteristics Of the Light Metals And Their Alloys

Part II

IN THE accompanying article, STEEL *continues publication of the American Society for Testing Materials' report "Service Characteristics of the Light Metals and Their Alloys" prepared recently by subcommittee VII of committee B-7 on light metals and alloys, cast and wrought. Part I appeared in the issue of Feb.* 11; *the third and concluding installment will be presented next week.*

MAGNESIUM is the lightest of our structural metals and many of its industrial uses can be attributed primarily to this property. The metal is produced commercially in one grade only with a nominal purity of 99.9 per cent (average purity 99.94 per cent), the normal impurities being aluminum, iron, manganese, and silicon. A very pure (99.99 per cent) distilled product is produced in limited quantities for certain specific purposes such as the degasification of radio tubes. The commercial grade of metal as well as magnesium-base alloys are sold chiefly in the form of ingots 4 inches in diameter and 12 to 16 inches long, weighing approximately 12 to 16 pounds each. The alloy ingots are differentiated by alloy identification and color marking.

Magnesium Always Alloyed

Magnesium is used as a structural material only in the alloyed form, never as the pure metal. It alloys readily with most of the common metals. Notable exceptions are iron, chromium, and certain related metals, which are practically insoluble in magnesium; and manganese which is soluble only to a limited extent, the solubility depending on the nature and amount of other alloying metals. The principal elements used for the production of commercial alloys are aluminum, manganese, zinc, tin, cadmium and copper. Each of these metals exerts a pronounced effect on the properties and casting or fabricating characteristics of magnesium. Many of these effects are additive with the result that most magnesium-base alloys contain more than one added metal.

Magnesium alloy castings may be made in dry sand, green sand, permanent molds, and in both low and high-pressure die-casting machines. Casting alloys containing 8 to 12 per cent aluminum (Nos. 1 to 3, Table IX) are susceptible to heat treatment with resultant property improvements. Solution heat treatment increases the tensile strength, percentage elongation, and toughness. Subsequent precipitation heat treatment or aging increases the yield strength and hardness, and decreases the percentage elongation and toughness. Magnesium casting alloys have properties comparable to those of the aluminum casting alloys.

Wrought alloys are available in various commercial forms, including plate, sheet, forgings, bars, rods, tubing, and structural shapes. These alloys are not subject to property improvement by heat treatment, hence the properties of such products are due to the alloy composition and to plastic flow of the metal either with or without accompanying strain hardening. Magnesium belongs to the closely packed hexagonal system and therefore hardens rapidly when subjected to small amounts of cold working. Maximum formability is obtained by working the metal warm or by frequent annealing when forming at room temperature.

The annealed sheet, of No. 6, Table X, can be formed at room temperature using a bend radius of $3t$ (where t = thickness of sheet). The hard-rolled sheets, Nos. 6 and 7, require a bend radius of 5 to 10 t, the radius tending to increase directly with sheet thickness and amount of cold working. All sheet may be hot formed within the temperature range 500 to 750 Fahr. (260 to 400 Cent.) using bend radii of 1 to 2 t.

Riveting (using standard aluminum alloy rivets) and welding are accomplished much the same on magnesium alloys as on aluminum alloys.

Magnesium Alloys Cut Easily

All magnesium alloys are noted for their remarkable machineability which is better than that of any other common metal. The cutting tools should be kept sharp, special care being taken that the clearance runs up to the cutting edge. The use of a lubricant or cutting compound is generally unnecessary due to the ease of machining and the slight generation of heat in ordinary machining operations. For details regarding machining and other phases of shop practice, manufacturers' publications may be consulted.

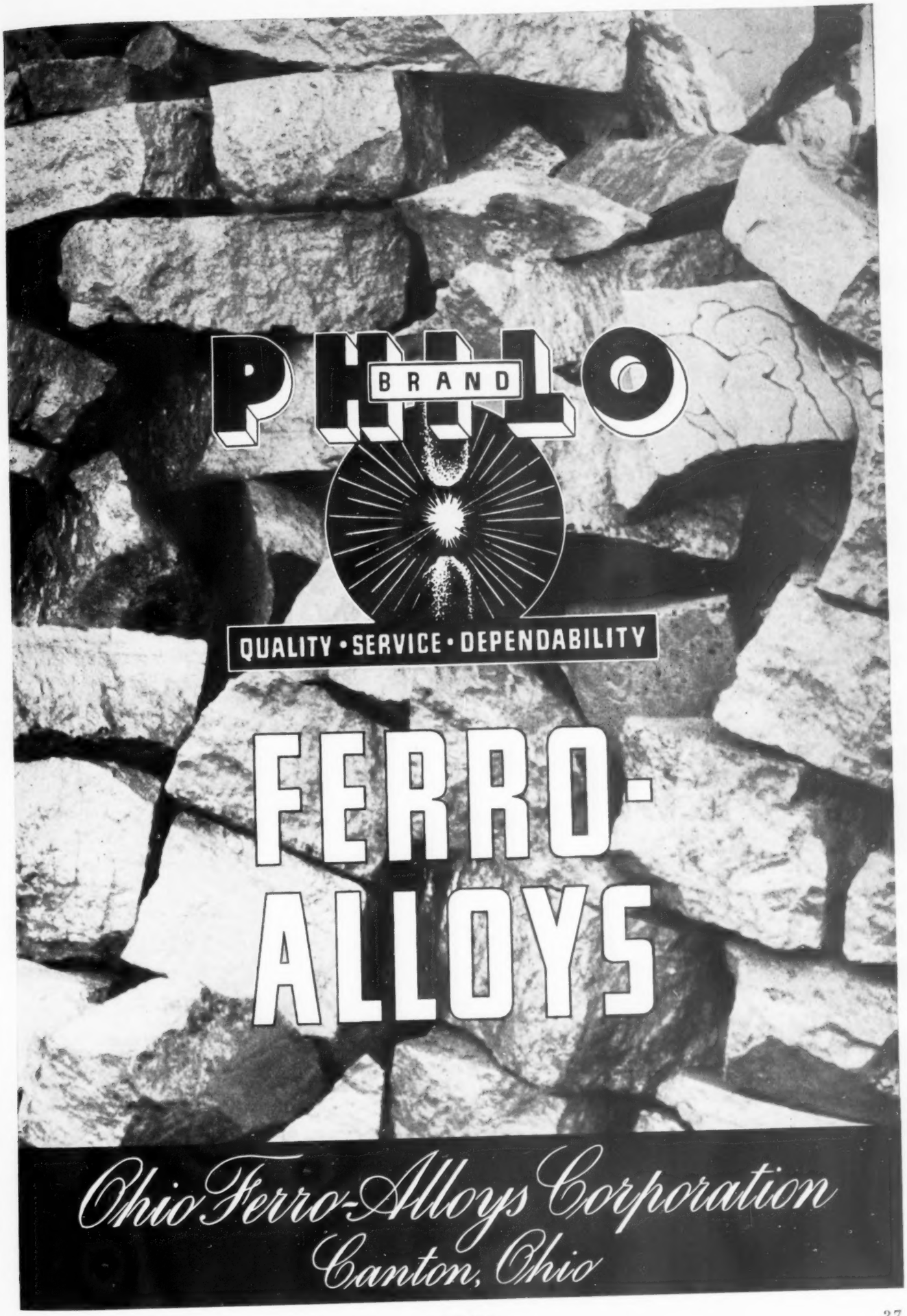
All materials have certain inherent properties which must be considered in some way when determining the suitability of the material for a given use, the relative importance of the several properties varying with the

Table IX

Nominal Composition of Magnesium Alloys, Cast and Wrought[a]

Item	Aluminum, per cent	Manganese, per cent	Zinc, per cent	Copper, per cent	Cadmium, per cent	Tin, per cent
No. 0	99.9 per cent magnesium					
No. 1	8.0	0.2	....	....	....	....
No. 2	10.0	0.1	....	....	....	....
No. 3	12.0	0.1	....	....	....	....
No. 4	6.0	0.2	3.0	....	....	....
No. 5	2.0	0.2	....	4.0	2.0	....
No. 6	4.0	0.3	....	....	....	....
No. 7	6.0	0.3	....	....	....	....
No. 8	6.5	0.3	0.75	....	....	....
No. 9	8.5	0.2	0.5	....	....	....
No. 10	....	1.0	....	....	....	6.0
No. 11	....	1.5	....	....	....	....

[a] Magnesium content = remainder.


PHILO
BRAND
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FERRO-
ALLOYS
Ohio Ferro-Alloys Corporation
Canton, Ohio

proposed application. In the case of the light metals as a class, their weight, or strength-weight ratio, is a controlling factor in most applications in which they are used. The alloy chosen is then usually dictated by one or more of the other characteristics. The following discussion attempts to outline the reason why light alloys are used in certain fields.

Aluminum and magnesium alloys are used in aircraft construction primarily because of their light weight or high strength-weight ratio. To function successfully, they must either resist the corrosive action of salt water and atmospheres or else admit of treatments which will resist these conditions. In those cases where the weight alone is the controlling factor, the strength-weight ratio of the alloy chosen must equal or exceed that factor for other commercially available materials in order to justify their choice. In determining this factor, the weight of necessary protective coatings must be included as well as the mechanical stability of the completed structure, since to take advantage of a high strength-weight ratio may in some cases result in undesirably thin materials. Occasionally, design conditions arise in which the modulus of elasticity of the light alloys requires the sacrifice of a part of the strength-weight ratio.

Requirements other than weight sometimes determine what light metal or alloy is used, as in the case of pistons. The lower unit weight would dictate magnesium alloys for pistons but three other important requirements are: (1) Resistance to wear, (2) low thermal expansion, and (3) high thermal conductivity. Because aluminum meets the requirements better with reference to these three requirements it gives a better result even though some weight advantage is sacrificed by its use. In the selection of the particular alloy of aluminum to use for this part, these three properties are again the determining factors. In other words, the alloy with the highest thermal conductivity, lowest coefficient of expansion and highest strength and hardness at piston operating temperatures, along with satisfactory casting and machining properties, will be the one selected.

Structural parts such as struts, beams, wheel rims, fittings, wing covering, bolts, rivets and screw machine parts are all made from rolled, forged, drawn or extruded aluminum alloy shapes. The alloy must be such as to permit as high a stress as possible and the particular alloy is determined also by its resistance to atmospheric corrosion, although resistance to highly corrosive conditions is sometimes obtained by application of organic coatings.

The alloy chosen for low-stressed parts such as tanks, cowling, streamline coverings, and minor fittings is usually dictated by the weldability, forming properties, corrosion resistance or machineability. In these parts, the lower-strength, common alloys usually are employed.

Aluminum alloy castings are often used in many aircraft structures. Such castings should not, however, be used without a careful consideration of alloy, design, and strength requirements. Foundry technique and X-ray inspection can do much toward increasing the reliability of such parts. When properly designed and executed, such parts as wheel hubs, fittings, brackets, tail-wheel forks and miscellaneous engine castings have proved very satisfactory.

Table X

Typical Mechanical Properties of Magnesium Alloys, Cast and Wrought

Modulus of elasticity is 6,500,000 lb. per sq. in.

Item	Condition[a]	Tensile Strength, lb. per sq. in.[b]	Yield Strength (Set = 0.2 per cent), lb. per sq. in.[c]	Elongation in 2 in., per cent	Brinell Hardness Numbers[d]	Rockwell Hardness Numbers, "E" Scale	Compressive Strength, lb. per sq. in.	Shearing Strength, lb. per sq. in.	Charpy Impact, ft-lb.	Endurance Limit, lb. per sq. in.[e]
No. 1...	Sand cast	25 000	11 000	4	48	55	46 000	17 000	0.9	7 000
	Sand cast H. T. 1	33 000	11 000	9	48	55	46 000	17 000	2.2	7 500
No. 2...	Die cast	29 000	20 000	1	63	75	.....	.....	...	.....
	Sand cast H. T. 1	33 000	12 000	7	51	61	51 000	20 000	2.0	11 500
	Sand cast H. T. 2	33 000	16 000	3	60	72	51 000	21 000	1.0	10 000
	Sand cast H. T. 3	33 000	19 000	1	69	80	55 000	22 000	0.7	10 500
No. 3...	Sand cast H. T. 3	29 000	21 000	0.5	75	84	55 000	18 000	...	.....
No. 4...	Sand cast	28 000	11 000	5	48	55	46 000	19 000	1.0	7 000[g]
No. 5...	Sand cast	24 000	8 000	6	40	34	39 000	15 000	...	6 000
No. 6...	Extruded[f]	40 000	26 000	15	48	55	58 000	20 000	2.2	13 000
	Forged	38 000	23 000	12	50	60	.....	.....	...	12 000
	Sheet	43 000	30 000	8	65	76	.....	.....	...	.....
	Sheet annealed	35 000	19 000	14	55	66	.....	.....	...	.....
No. 7...	Extruded[f]	42 000	30 000	14	53	64	61 000	21 000	...	16 000
	Forged	38 000	23 000	12	52	62	.....	.....	...	12 000
No. 8...	Extruded[f]	43 000	28 000	15	55	66	54 000	22 000	2.0	16 000
	Forged	42 000	28 000	9	59	71	.....	.....	2.2	.....
No. 9...	Forged	45 000	32 000	6	72	82	40 000	23 000	1.4	16 000
No. 10...	Forged	35 000	19 000	5	45	49	.....	.....	2.0	9 000
No. 11...	Extruded[f]	42 000	26 000	7	42	40	37 000	19 000	...	7 000
	Sheet	33 000	21 000	6	50	60	.....	.....	...	.....

[a] H. T. 1 = Solution heat treatment.
H. T. 2 = Solution heat treatment + partial aging.
H. T. 3 = Solution heat treatment + complete aging.

[b] Tension specimens are according to A.S.T.M. Tentative Specifications for Magnesium-Base Alloy Sand Castings (B 80 - 34 T); for Magnesium-Base Alloy Sheet (B 90 - 34 T); for Magnesium-Base Alloy Forgings (B 91 - 34 T); and for Magnesium-Base Alloy Ingot for Remelting (B — - 34 T), *Proceedings*, Am. Soc. Testing Mats., Vol. 34, Part I (1934); also 1934 Book of A.S.T.M. Tentative Standards.

[c] Yield strength is defined as the stress at which the stress-strain curve deviates 0.2 per cent from the modulus line.

[d] Brinell hardness is obtained with 500-kg. load, 10-mm. ball.

[e] R. R. Moore type rotating-beam machine—500 million cycles.

[f] Properties of extruded material for round and square up to 1¼ in.

[g] Approximate value.

Production of Castings

Depending on the application and quantity desired, these parts may be produced as sand, permanent mold, or die castings. Sand casting is the most flexible process, applicable to a great variety of intricate parts produced in small or large quantities. Permanent-mold casting is generally confined to those parts required in some quantity, such as pistons and fittings, but will provide strengths somewhat in excess of those obtainable in sand castings. Die casting permits quantity production of parts with excellent surface appearance and requiring a minimum of finishing, but is generally used for parts which are not highly stressed in service.

Forgings of heat-treated aluminum alloys provide maximum strength and reliability. They are particularly reliable for the highly stressed parts of aircraft structures. Typical illustrations of forged products are propellers, crankcases, pistons, bearing supports, link rods and fittings.

For structures in which stiffness or rigidity are important, a high modulus of elasticity is desirable and for this reason, the light alloys are sometimes at a disadvantage when compared with steel. In such cases it is usually necessary to design parts so that the useful weight is as far from the centroid as is consistent with the practical requirement of stability. In sheets, this may be accomplished by corrugations, bumps or ribs.

Magnesium alloys are used to some extent in aircraft primarily for castings, such as wheels, brackets,

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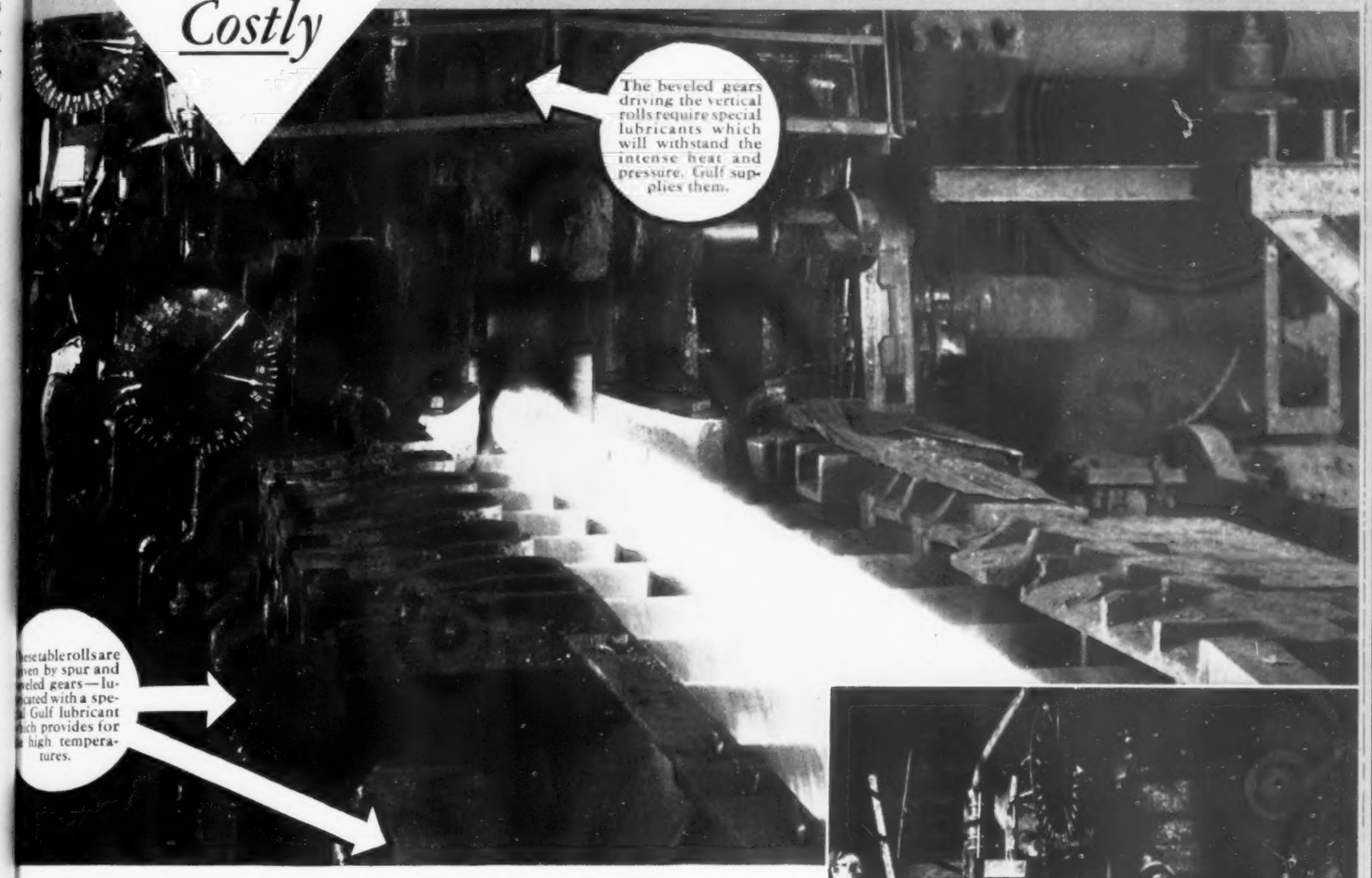
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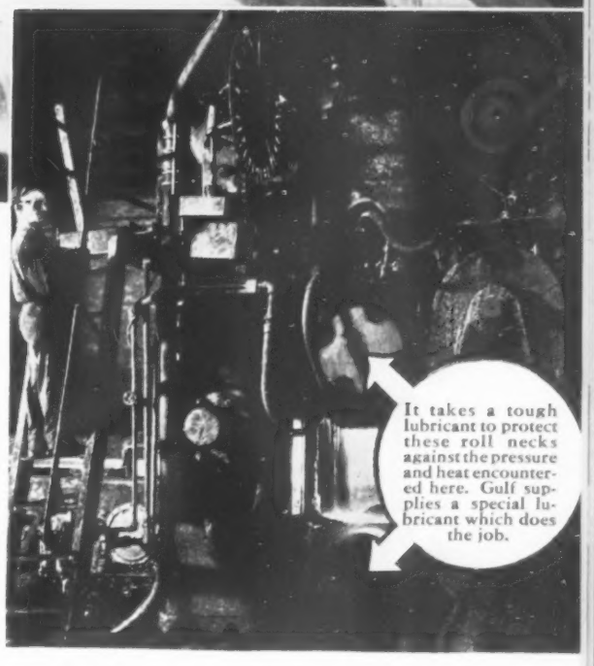
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housings, crankcases and various engine parts. There would be a more extensive use of these alloys, particularly in sheet form, were it not for certain limitations in their corrosion resistance. With the exception of salt atmospheres, their resistance to corrosion is generally good. Adequate paint protection will assure good corrosion resistance, even to salt atmospheres.

The automotive industry affords a large field for light alloy parts, both cast and wrought. Weight reduction, ease of fabricating and finishing, high thermal conductivity, appearance, and corrosion resistance are the principal considerations governing these applications.

Material weight reductions in commercial vehicles can be secured by the use of light alloys in the body, chassis, and fittings. Where a few years ago the use of these alloys in this field was limited to minor fittings, it has now been extended to the point where complete light-alloy construction is common. The weight thus saved in the bodies is used to reduce operating costs, increase payload or improve operating schedules. Some factors in addition to weight savings at times further promote the use of light alloys in this field, while consideration of first cost, so important in pleasure cars, is reduced or eliminated by subsequent operating economies.

Automotive Use Limited

Material reduction in weight of many pleasure cars could be accomplished by the use of light alloys, but, except for a few cars in the higher-price fields, the present prices of these metals has confined their use to only certain parts where this requirement is urgent. An example of this is the piston. At high engine speeds, the velocity of this part fluctuates from zero to maximum at a very high frequency. Light weight is therefore desirable to accomplish these rapid changes with as little vibration as possible. Since piston inertia is a large part of the load on connecting-rod bearings, light weight also reduces bearing loads and increases their life.

Pistons of Aluminum

Engineering opinion differs somewhat as to the minimum size aluminum alloy piston justified from the standpoint of weight saving and thermal properties. The larger the piston the more imperative it becomes to use aluminum, particularly since the high thermal conductivity is needed to keep the head of the piston cool enough to prevent preignition and knocking.

The aluminum alloy selected for pistons must be one that exhibits the necessary uniform strength and hardness at operating temperatures, resists ring groove wear and deformation, and has good bearing characteristics. The coefficient of expansion should be as low as possible and the piston should attain dimensional permanence by simple, inexpensive treatments.

Crankcases and oil pans for automotive engines are frequently made of light alloys, as a means of reducing engine weight. The high thermal conductivity of aluminum results in lower crankcase oil temperature, which is desirable, and in some cases has made other means of oil cooling unnecessary. The alloy selected should combine desirable casting characteristics with necessary strength and soundness.

Bearing caps must be made of light alloys when the crankcase is of these materials in order to maintain bearing concentricity. Forgings are most desirable for this application because of the strength required, although heat-treated castings are sometimes used.

Aluminum alloys, on account of their high thermal conductivity, are frequently used for cylinder-head castings. More uniform head temperatures result from their use, permitting higher compression ratios, increased power, and better volumetric efficiency concurrent with a cooler cylinder head. Semi-permanent mold and sand castings of alloys suitable for pressure-tight castings and having satisfactory corrosion resistance generally are used.

The use of aluminum alloy brake shoes improves braking action because of their thermal conductivity and expansion. The corrosion resistance also is desirable since such parts must resist attack by water which gains admission to the mechanism. Although experience with magnesium alloys in these parts is lacking, proper design may result in satisfactory shoes of these alloys.

Where lightness of structure is desirable, the additional requirements for general structural work are strength, stiffness and resistance to corrosion. Many types of structures where necessity for low weight makes it desirable to use aluminum or magnesium are subjected to special conditions which demand certain characteristics of the material used.

Aluminum for Weight Saving

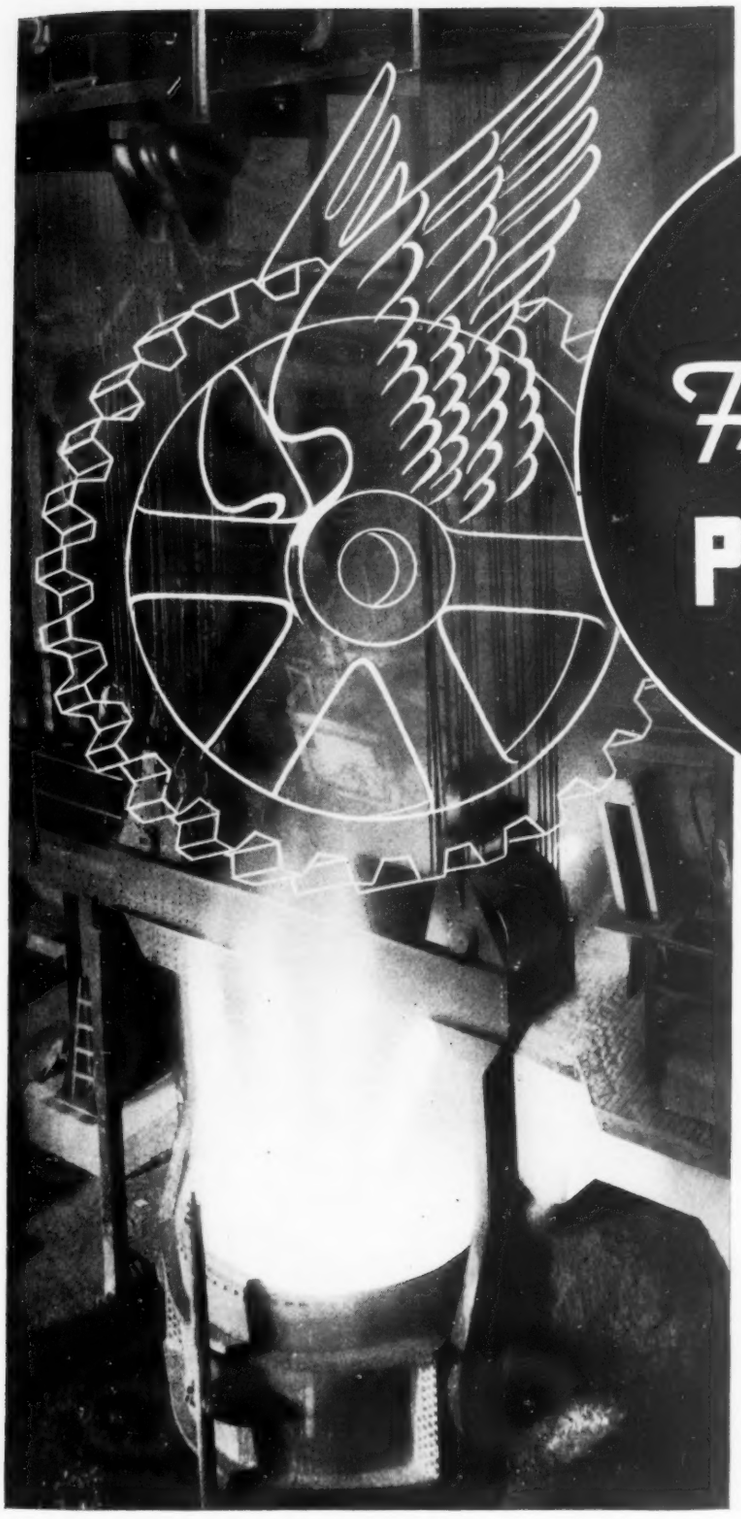
Almost invariably, the principal reason for using aluminum in structures is to save weight, as is well illustrated in dragline booms and buckets. With respect to the former, for instance, a composite boom in which the lower 35 feet and some of the fittings were steel and the upper 140 feet were aluminum, the total weight of the fully-rigged assembly was 29,000 pounds; 37 per cent less than the weight of a 150-foot all-steel boom which it replaced. In general, all-aluminum construction permits a 15 to 20 per cent increase in length or a 20 to 25 per cent increase in bucket capacity, compared with steel booms. In the dragline bucket, a composite aluminum-steel construction will weigh about 50 per cent less than an all-steel one of the same capacity or, for the same gross weight loaded, the former has about a 33 per cent greater capacity. Another striking illustration is the all-aluminum floor system installed on a bridge in Pittsburgh. Here a weight saving of about 750 tons was effected by using 350 tons of aluminum; a saving both permitting a higher vehicle load

Table XI

Physical Properties of Magnesium Alloys

Item	Condition[a]	Specific Gravity	Weight, lb. per cu. in.	Melting Range		Coefficient of Thermal Expansion, 65 to 750 F.	Thermal Conductivity, c.g.s. units, 100 to 300 C.	Electrical Resistivity, michroms per cu. cm., at 20 C. (68 F.)
				deg. Fahr.	deg. Cent.			
No. 1...	Sand cast	1.80	0.065	1120–815	605–435	0.000016	0.18	13.0
	Sand cast H. T. 1	1.80	0.065	1120–815	605–435	0.000016	....	15.0
No. 2...	Sand cast	1.81	0.066	1100–815	595–435	0.000016	0.17	15.0
	Sand cast H. T. 1	1.81	0.066	1100–815	595–435	0.000016	....	17.5
	Sand cast H. T. 2	1.81	0.066	1100–815	595–435	0.000016	....	16.0
	Sand cast H. T. 3	1.81	0.066	1100–815	595–435	0.000016	....	14.0
No. 3...	Sand cast H. T. 3	1.82	0.066	1070–815	575–435	0.000016	0.16	14.0
No. 4...	Sand cast	1.84	0.066	1155–750	625–400	0.000016	....	....
No. 5...	Sand cast	1.86	0.067	1185–1050	640–565	0.000016	0.30	6.5
No. 6...	Extruded	1.77	0.064	1160–815	625–435	0.000016	0.23	10.0
No. 7...	Extruded	1.79	0.065	1140–815	615–435	0.000016	0.20	13.0
No. 8...	Extruded	1.81	0.065	1155–	625–	0.000016	....	....
No. 9...	Forged	1.83	0.066	....	...	.....	....	....
No. 10...	Forged	1.85	0.067	....	...	.....	....	....
No. 11...	Extruded	1.76	0.064	1200	650	0.000016	0.30	5.0

[a] H. T. 1 = Solution heat treatment.
H. T. 2 = Solution heat treatment + partial aging.
H. T. 3 = Solution heat treatment + complete aging.



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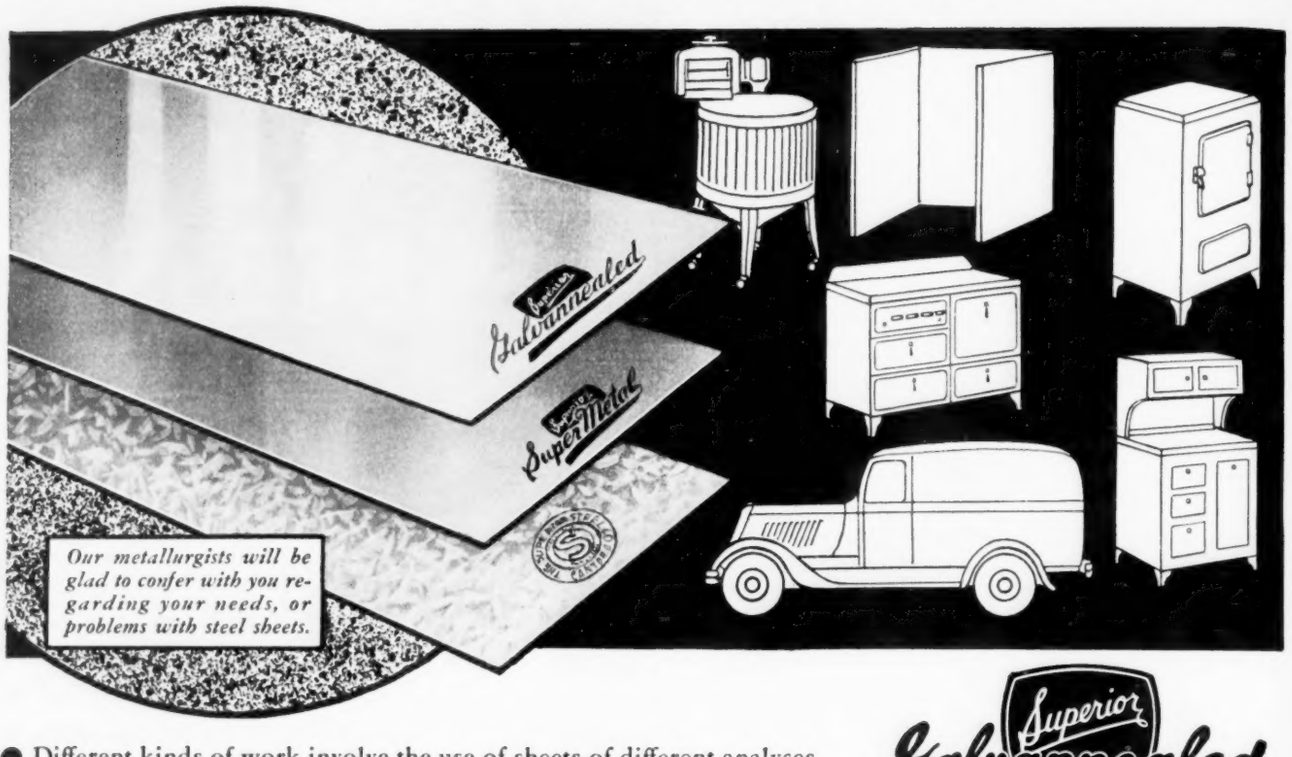
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limit and obviating the necessity of replacing the bridge for an estimated 25 years.

There are numerous other applications where lightness is of major consideration, such as, rotors for air motors, high-speed reciprocating machine parts, resonator horn disks, envelope folding machine parts, spools for winding wire, parts for vacuum cleaners, office machines, furniture, portable tools such as air hammers, breast drills and air-driven grinding wheels, wheelbarrows, concrete carts, foundry flasks, match plates and core boxes. For most of these applications, the alloy to be used is chosen for its mechanical properties, and resistance to severely corrosive conditions is improved by painting.

A great variety of uses for light metals also result from their low rate of reaction in various chemicals. A notable example of this is the use of magnesium for hydrofluoric acid containers. Until recently, paraffin or lead was used for these containers but magnesium now appears to be a superior material for the purpose. Other successful uses of magnesium are: Equipment for manufacturing and storing certain types of organic chemicals, glue rollers, and bakers' oven peel and roll-type biscuit molds. Aluminum is proving successful for nitric and acetic acid containers, brewing equipment and beer barrels, rayon-spinning equipment, candy molds and dairy equipment.

Aluminum Architectural Work

The requirements for aluminum used in architectural work are: Color, ability to take suitable finishes, corrosion resistance, and light weight for ease of erection. Examples of outside parts made of aluminum alloys, which must resist rather severe atmospheric corrosion in some localities, are windows and spandrels. These conditions may involve damp air, salt air, or sulphur-laden atmospheres in active industrial localities. Other outside fittings such as doors, flashings, cornices, marquees, ornamental crests, grilles, hardware, screens, screen frames and roof-type ventilators also are frequently made from aluminum to increase maintenance economy and reduce or eliminate stains on adjacent surfaces. Anodic coatings are now being applied to much outside architectural work, with the result that maintenance is practically avoided.

The extensive use of aluminum in railway equipment has resulted from two chief factors: A desire for reduced weight, and the availability of the material in numerous forms and shapes. It is being used for all types of equipment, in applications varying from minor parts to complete cars or trains. All-aluminum hopper cars, tank cars and Pullman cars have been built which show material weight savings and have satisfactorily met service and safety requirements. Generally, the parts are protected by suitable finishes, but in some applications, transportation of sulphur or high-sulphur coal for instance, the inherent corrosion resistance of the metal is an advantage. Interior fittings, such as seat frames, doors, window frames and sashes, and interior finish paneling must be suitably finished for appearance and tarnish resistance. Hardware subject to contact with the hand must be treated to prevent staining and must not soil hands or gloves with which contact is made.

General structural members must possess high strength and are designed for suitable rigidity. These parts are rolled shapes or plates, extruded sections, castings and forgings. They require painting or other coating for complete protection against corrosion. With the advent of diesel engines as the power unit for drawing railroad trains, light alloys find additional applications. Upper and lower frames, bed plates, cylinder heads, blower and gear housings, cover plates, etc., are made of light alloys to reduce the weight-power ratio. Pistons for diesel engines are made of cast aluminum alloy but the duty is much more severe than in automobile or airplane engines. The larger mass of such pistons made light alloys desirable in reducing vibration and bearing loads.

Aluminum alloys are used extensively for cast and wrought cooking utensils. For this purpose the requirements are good appearance, corrosion resistance, light weight, ability to polish well, and nonreaction with various foods cooked therein. The high thermal conductivity of aluminum alloys is useful in cooking utensils because it transfers the heat rapidly to all parts of the vessel resulting in more rapid heating. The same property makes it valuable for refrigerator trays for freezing ice cubes. The rapid heat transfer aids in removing the heat from the water. Ice cube trays being continually in contact with water or moisture are treated electrolytically to coat them with a thin layer of aluminum oxide. This makes the surface completely inert to any change over a long period of time.

One of the requirements for washing-machine parts and laundering equipment is that no rust shall form to spot the clothing. The non-rusting of aluminum alloys permits their use for these purposes. In addition, its lightness is always desirable for any household article which must be handled or lifted.

Household furniture is required to be strong, light and pleasing in appearance. Aluminum and magnesium alloys are being used for this purpose. The articles of furniture are made from rolled, drawn or extruded sections which are welded together into any desired shape or form. The requirement of appearance is met by either using the natural metal color or by lacquering it in any desired way. The result is a very light piece of furniture which is more durable than a similar one made from wood.

The list of examples may be greatly extended but it is sufficient to state that any household article where either lightness, corrosion resistance, inertness to ordinary foods, or all three, are desired may be made from aluminum, and in some cases from magnesium alloys.

(To be concluded)

Table XII

Foundry Characteristics of Magnesium Casting Alloys

Item	Type of Casting	Solidification Range		Fluidity (Order of Merit) 1 = Best	Shrinkage, in. per ft.[a]	Hot Shortness (Order of Merit) 1 = Least
		deg. Fahr.	deg. Cent.			
No. 1	Sand	1120–815	605–435	3	$\frac{3}{16}$	2
No. 2	Sand Permanent Die	1100–815	595–435	2	$\frac{3}{16}$	1
No. 3	Sand Permanent	1070–815	575–435	1	$\frac{3}{16}$	1
No. 4	Sand	1155–750	625–400	3	$\frac{3}{16}$	2
No. 5	Sand Permanent	1185–1050	640–565	4	$\frac{3}{16}$	3

[a] Use $\frac{5}{32}$ in. per ft. on large castings or where heavy cores prevent free shrinkage. For castings under 26 in. in any one dimension, no changes are required in pattern equipment designed for aluminum alloys.

Some Reflections on the Use of Stainless Steel in Dairy Equipment

BY W. J. WACHOWITZ, President,
Alloy Products Corp., Waukesha, Wis.

THE National Dairy Industries exposition held in Cleveland in October was considered one of the largest shows ever held. It occupied 250,000 square feet of floor space, and there were approximately 150 carloads of dairy machinery, equipment and supplies displayed by 225 exhibitors. Every type of equipment used in the dairy and ice cream industry was shown. Attendance was over 16,000, and the registration list showed people attending from all over the world.

Progress being made by the industry in adopting stainless steel for all types of equipment was a significant feature of the display. About seven years ago only one exhibitor—the writer's company—showed stainless steel equipment at the show. Because the material was so new, considerable comment was raised both for and against stainless steel; but in spite of the higher cost compared with previous types of materials, stainless steel has been adopted increasingly each succeeding year. Accordingly, this year the show was practically a stainless steel exhibit from one end to the other.

Becomes Brighter with Use

Stainless steel certainly has proved to be a worthwhile material for sanitary use. It does not stain, tarnish, rust or corrode, and it will resist all chemical actions in dairy products, actually becoming brighter with use. Furthermore, depreciation and maintenance costs are low.

The writer's company now has over 900 various sizes and types of stainless steel equipment in service with most of the nationally known dairy and food plants in this country. Most concerns are using stainless steel in specifications without any hesitation or fear. Considerable missionary work has been done by the steel companies and fabricators, but the writer believes that engineers of the steel companies are not working together, as far as furnishing information to the trade is concerned.

Many of the large dairy plants have their own capable engineering departments in which certain types of equipment are being designed. In some cases engineers of the dairy companies have requested visits from steel company engineers, at which time drawings would be made and the steel company engineers would be asked to make recommendations covering gages of material and other details. If there were five or six steel companies on the job, the dairy engineer would receive five or six opinions; then he would call in the fabricators and receive numerous other opinions. This made the engineers hesitate about making a decision inasmuch as they could not decide who was giving them the right type of information.

Now, this information certainly should be presented to dairy engineers or fabricating plants by the steel companies with more uniform recommendations because, after all, most steel companies are producing stainless steel under the same basic patents, where analysis, tensile strength, gages, polishes and the like are similar. There certainly is no reason why recommendations for certain types of equipment should not be more uniform than they are today. This would help the entire industry promote the sales of stainless steel sheets, even for industries which are not now using the material.

Fabricators Lack Knowledge

Many other factors enter into the stainless steel picture. In the past, stainless steel producers have been criticized unjustly by many fabricators not familiar with handling this new material; even though the steel companies use every precaution through their laboratories and mills for rolling sheets and annealing them uniformly, thus producing a high-grade product. This good sheet is shipped to some fabricator who is not familiar with handling stainless steel, for fabrication into some utensil or equipment. Since stainless steel is reputed to be a strong material, most fabricators are under the impression that they can use just half the thickness as compared with ordinary steel. This equipment is made and then placed into service

(*Please turn to Page* 58)

One of the largest stainless steel tank and coil units ever built—installed in the Anheuser-Busch brewery in St. Louis. The tank is 18 feet in diameter, 24 feet deep and will hold 38,000 gallons. It is used in fermenting yeast

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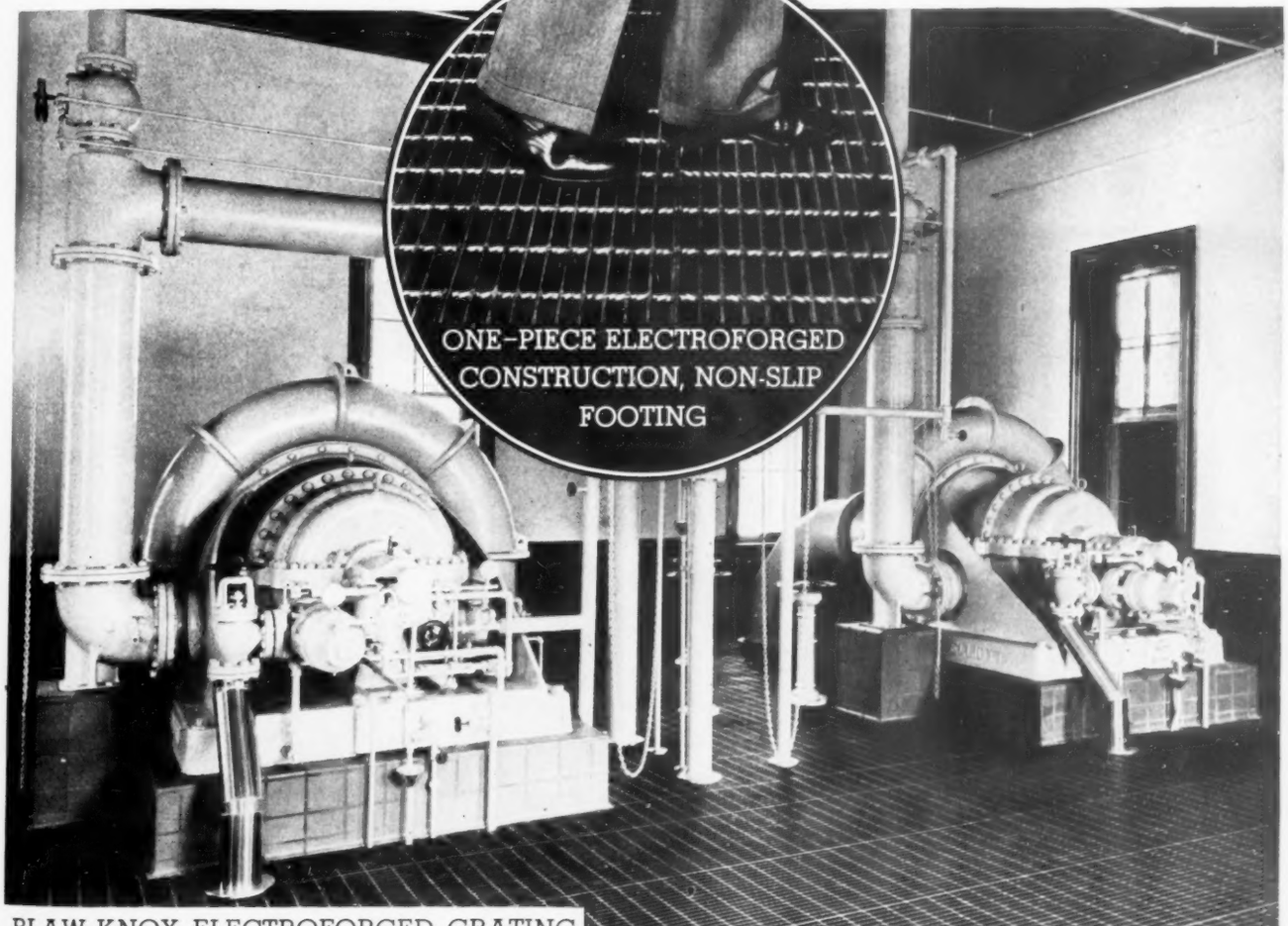

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s s s

Cold Drawn Bridge Wire Shows Highest Endurance

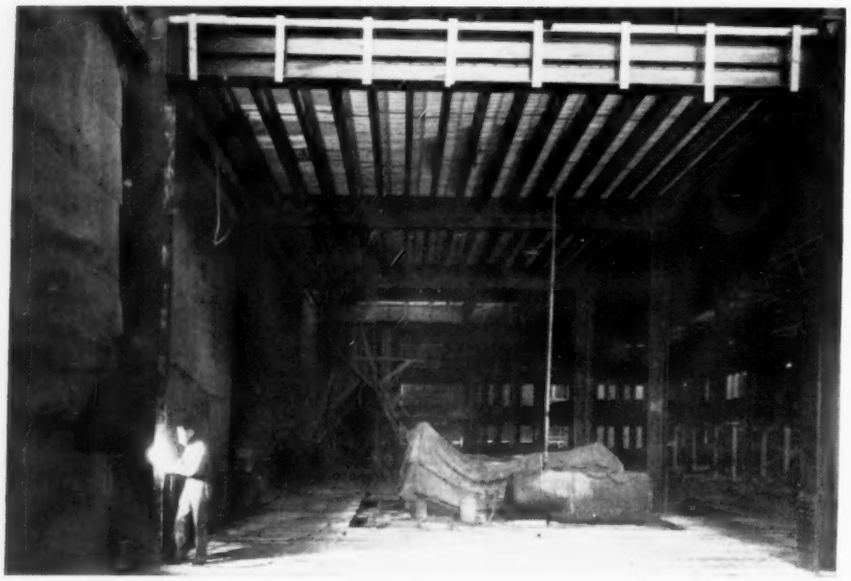
In its study of steel wire for bridge cables, the national bureau of standards has found that in static tensile loading of heat treated wire and of cold drawn wire looped over a curved support the cold drawn wire assumes the curvature of the support more quickly and more closely than heat treated wire, a fact in agreement with previous laboratory tests. Fluctuating tensile loading of similar specimens has shown cold drawn wire to have distinctly higher endurance. The smoother unpitted surface of cold drawn wire, demonstrated metallographically, evidently is closely related to this difference.

s s s

Nickel Plating Protection Depends on Thickness

The total thickness of electroplated nickel, or copper and nickel, coatings on steel is the most important factor in their protective value, regardless of whether or not chromium is also applied. This is a conclusion reached in an investigation completed recently by the national bureau of standards, Washington. Coatings with a thickness of only 0.00025-inch are practically worthless for outdoor exposures in any location, and those with a thickness of 0.0005-inch are valuable only in mild locations. Fair protection was obtained with 0.001-inch and almost perfect protection with 0.002-inch of

25,000 Welds on Building



TWO IDEAS FOR STRUCTURAL ENGINEERS: During recent erection of a nine-story addition to the Block department store in Indianapolis, Ind., electric arc welding found two interesting applications. One: Exterior wall columns of the existing building were strengthened to bear additional floor loading of the adjacent bays of the addition. Two: Galvanized corrugated sheet was laid to form a support for concrete floors during pouring. In strengthening existing exterior wall columns, steel plates were welded across flanges of H-columns, extending from basement to top floor. At the basement level, plates were 14 inches wide and 2⅛ inches thick, sizes being graduated on the way up, until at the top floor, plates were 10 inches wide and 1¼ inches thick. Fillet welds were used, each 3 inches long and spaced 6 inches from adjacent welds; 5000 welds were made, requiring 1200 pounds of electrodes supplied by General Electric Co., Schenectady, N. Y. About 400 pounds of electrodes was used in making 20,000 tack welds on the corrugated sheets through from two to four thicknesses of metal

nickel. It is evident that the most practical way of increasing the protective value of nickel deposits is to increase their thickness.

S S S

Fused Soda Ash Improves Machinability of Iron

Several iron foundries have found recently that by using a 100 per cent scrap charge in the cupola plus the combination of fused soda ash briquets and phosphate rock a marked saving in new material is effected. The fused soda ash has the same effect that ground glass has in nonferrous foundries in that the slag is consolidated. The use of phosphate rock imparts a phosphorus content to the resulting iron. Foundries employing this practice have found that the resulting castings have an increased machinability. Addition of the fused soda ash and phosphate rock may be made in the ladle.

S S S

New Rust Preventative Is Brushed, Sprayed or Dipped

One of the recent new materials developed to protect metal surfaces against rusting is a liquid which can be brushed, sprayed or applied by dipping. It forms a hard coating which is impervious to the usual corrosive agents as well as being resistant to abrasion. While the coating is hard, it is said not to be brittle and can be flexed to a considerable degree. The material, according to the claims of the manufacturer, dries overnight, is not affected by extreme cold, and withstands heat up to 650 degrees Fahr. It is particularly suited for use in a single coat on interior piping, on vats, structural parts, and other metal surfaces. It can be used as an undercoat for exterior painting on metal surfaces, as a vehicle for aluminum powder and for red lead.

S S S

Inspection Keeps Grinding Equipment in Condition

Inspection of grinding equipment at regular intervals is well worth while as it not only aids in maintaining the machines at the most efficient operating point, but also enables proper determination of the causes of troubles which arise occasionally. For example, in the plant of a large manufacturer of gas stoves, considerable difficulty was encountered from 20 x 2 x 1½-inch wheels cracking. The natural reaction was to blame the trouble on defective wheels, but a careful search revealed that some of the spindles on the 2-wheel floor stand grinders were bent. As soon as they were put in the proper condition, wheel cracking was eliminated.

In another case of wheel cracking, it was observed that the lead bushing was flared over slightly on each side which indicated the possibility of considerable vibration. Check up of the machine showed that such was the case as the bearings were badly worn. In another plant some wheels developed cracks before they were in use for half an hour. Upon investigation it was found that the machine operator when mounting the wheels used a section of steel pipe on the wrench to insure the nut being screwed up tight. The excessive clamping pressure developed by that procedure caused the damage, and when it was eliminated, no more trouble was encountered.

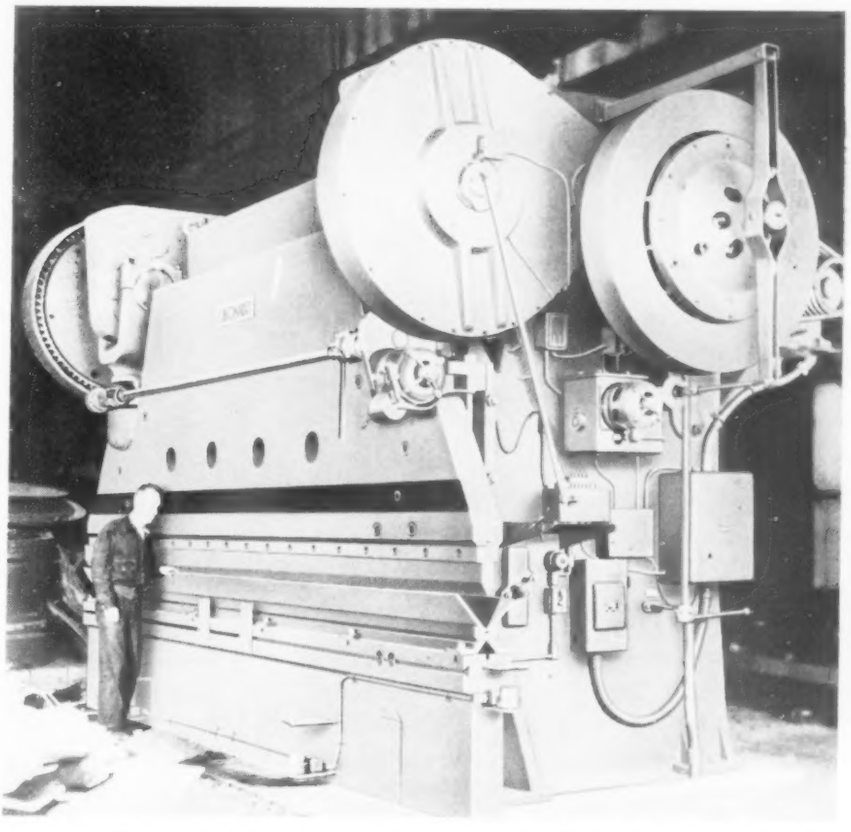
S S S

Silver Solder Overcomes Difficulty in Plating

An airplane manufacturer recently had difficulty in cadmium plating steel fittings used in the construction of planes. The fittings first were sandblasted and then plated and the trouble was due to the fact that the plate did not take very well on the inside of sharp corners on these fittings. The trouble was remedied by flushing over the corners with silver solder, after which the cadmium plating was applied successfully.

Large Press Brake Handles Heavy Plates 18 Feet in Length

BUILT to handle 1-inch steel plates in lengths up to 12 feet and ¾-inch plates in lengths up to 18 feet, what is claimed to be the largest machine of its type ever built for bending, flanging, forming and multiple punching recently has been completed by the Cincinnati Shaper Co., Cincinnati. This press brake, shown in the accompanying illustration, has been installed in the By-Products division of Lukens Steel Co., Coates-



This powerful press brake, developing safe working loads up to 1000 tons, is of welded steel construction and is claimed to be the largest machine of its type ever built for bending, flanging, forming and multiple punching

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307 GRADES OF SHEETS • STRIP • PLATES

ville, Pa. The unit is of characteristic design of the standard line of all-steel press brakes manufactured by the Cincinnati company. It has a clear distance between the housings of 12 feet 6-inches with an overall working length of die surface of 18 feet through a 14-inch throat.

The ram has a stroke of 6 inches and an adjustment of 6 inches, with a distance of bed to ram, stroke down and adjustment up of 14 inches. Independent adjustment to each end of the ram is provided to take care of fade out or cone work. Two speeds are provided through a gearshift transmission so that the machine may be operated at either 5 or 20 strokes per minute. The clutch is operated hydraulically by electrical control from each or all of several stations for convenient and effortless operation.

One set of five dies gives complete range for general purpose work in plates ranging in thickness from 10-gage up to 1 inch. The machine will develop safe working loads up to 1000 tons. A direct-reading load indicator, immediately behind the throat on the right housing, shows the load developed during any operation of the press, and also has a maximum load hand recording continually the heaviest load to which the machine has been subjected at any time in service.

Built of Flame-Cut Plates

The brake is of steel construction throughout, using heavy steel plates of analyses especially adapted to flame-cutting and welding, supplied by Lukens Steel. The housings, flame-cut from two steel plates 8 inches thick, 87 inches wide and 13 feet 8 inches long, weigh 33,000 pounds each. The bed and ram were flame-cut from two steel plates 7 inches thick, 72 inches wide and 18 feet long, weighing about 31,000 pounds each.

Main drive gears are of welded steel construction, with high-carbon steel providing the requisite tooth strength and wear resistance in the gear rim. The gear guards, which also act as outer auxiliary bearings, are of welded steel construction. The curved rim of the gear guards and the heavy top brace between the housings, which is almost a complete box section in one piece, were formed on the machine itself before they were put in place. Total weight of the machine complete is approximately 145,000 pounds.

Among the interesting features of the design of the machine is the use of a divided pitman which, in conjunction with the cylindrical supports for the bed and ram, assures the load of the press brake being carried directly on the center line of the housings, thus avoiding eccentric loading. The screw in the pitman is a heat treated nickel-chromium alloy steel forging cut with a buttress thread, having a full ball and socket joint, with ball ends hardened and ground. Ram adjustment is accomplished by independent motor through a hardened and ground worm and bronze worm wheel on the screw. In connection with the independent adjustment of each screw, dial indicators show the position of the screw or the ram with relation to the bed and also the position of each screw with reference to the other. Futhermore, for this independent adjustment of each end, pivotal slide bearings have been provided, running on hardened and ground steel guides on the face of the housing, with bronze gibs in the slides.

Another interesting feature is the use of ball bearings under the steel flywheel, which is 56 inches in diameter, weighs 4000 pounds, and runs at 600 revolutions per minute. The flywheel shaft is mounted on two double tapered roller bearings. The multiple disk clutch is contained in the outer face of the flywheel. The friction disks are 32 inches in diameter.

The several electrical control stations are arranged with cut-out switches so the machine may be operated from any one station or may require the operator at each point to push his button before engaging the clutch as a matter of safety. The control further permits operation with the machine making either a complete cycle with the stop at the top, or for continuous running, or for a jogging or hunching operation. Floor-type pushbuttons are used.

The oiling system has two stations, one on each housing, furnishing complete automatic lubrication. The brake is driven by a 50-horsepower high torque motor, connected by vee-belts to the flywheel.

Large-Diameter Arc Welded Pipe Used In Owyhee River Siphon Projects

TWO huge siphons, one 10½ feet, the other 9 feet in diameter, are being constructed on the Owyhee river in eastern Oregon for the bureau of reclamation. The 9-foot pipe is being arc welded into one solid tube 1630 feet long. The 10½-foot section is 900 feet in length. Both use pipe and materials furnished by the government and are a part of the north canal in the Mitchell-Butte diversion of the Owyhee project.

The first pipe to be installed in the Owyhee siphon was placed in the bottom of the Owyhee canyon June 1, 1934. This section is 700 feet in length and of 9-foot diameter pipe, fabricated from 3/16-inch steel plate, and placed in a trench 29 feet deep, later to be completely encased in concrete. Fig. 1 shows this section of the line after it had been installed (Illustration on page 50).

Given One-Month Test

After the lower section was welded in place, heavy test heads were welded on each end and the line tested to 200 pounds for a period of 12 hours. Following this test, the same pressure as that effective when the siphon is placed in use, was held in the line during the time the concrete was being poured and for ten days afterward, making a total test period of approximately 30 days. There were no leaks whatever in the field welding of this section.

The field joints on the encased portion of the Owyhee siphon were butt vee-type with no backing up strap, while the joints on the exposed section were butt vees with an outside butt strap ⅜-inch thick.

Heat Causes Difficulty

High mid-day temperatures (125 degrees in the shade), caused some difficulty in fitting the joints. In the case of the flat river section, after the string became more than 200 feet in length, it was found that the top of the pipe had a tendency to become longer than the bottom. A method was devised whereby the tops of the sections were secured by tack welding and the bottoms by pull jacks, leaving a gap at the bottom sometimes as much as ¼-inch greater than the top gap. The following morning, with the temperature equalized, no trouble was experienced in bringing the pipe flush and tack welding.

The welding was accompanied by a thorough peening with pneumatic tools. Skilled pipe welders were qualified by test. Two thirds of the joints required staging inside and out due to the steep grades. A total of 13 passes and 41 hours were required for each 13/16-inch butt vee joint.

The trestle shown in Fig. 1 was used for diverting the Owyhee river while the pipe was being laid. After the job is finished, the river will be above the siphon.

At present, the pipe on the two hillsides of the Owyhee siphon is being installed and is practically completed. The plate used on the

FIG. 2 (left)—A closeup view of the expansion joints and anchors of the Snively siphon, pipe being 10½ feet in diameter, assembled by arc welding

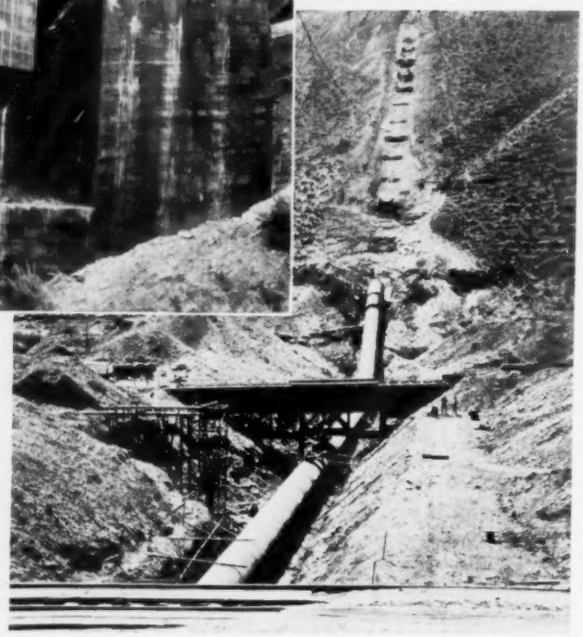

FIG. 1 (right)—Owyhee siphon after the lower 700-foot section across the canyon had been completed. The trestle was used for diverting the water of the Owyhee river while the pipe was being laid

hillsides ranges from 13/16-inch to ⅜-inch.

The Sniveley siphon, located about 3 miles from the Owyhee siphon, and a part of the same canal which goes through the Owyhee project, uses pipe 10½ feet in diameter, ranging in wall thickness from ½-inch to ⅜-inch.

This second siphon was started just after the lower crossing of the Owyhee siphon had been finished, and is 900 feet in length. Pipe was delivered in 20-foot lengths and placed by a crane where conditions permitted. On the steep slopes the pipe was slid over the piers on rails.

Welded Similarly

The pipe is entirely supported on rollers and anchors. The welded joints used in joining the pipe were similar to those used on the exposed portion of the Owyhee section; that is, butt vee with a ⅜-inch butt strap on the outside. Each joint required nine passes and 29 hours welding time. Fig. 2 shows part of the Sniveley siphon, including expansion joints and anchors.

A crew of approximately 25 men and four arc welding machines handled the placing of the pipe and the field welding on these two projects. The Olson Mfg. Co., Boise, Idaho, placed and welded the pipe. Two sizes of electrodes—5/32 and 3/16-inch—were specified by the bureau of reclamation, and were supplied by the Lincoln Electric Co., Cleveland. Pipe was furnished by the Chicago Bridge & Iron Works, Chicago.

Both these siphons would have been completed in much shorter time had it not been for the fact that the government decided to stress relieve the field welds. This was done by using an oil-fired portable ring furnace which heated the joint to 1100 degrees Fahr., at which temperature it "soaked" for about an hour and then was allowed to cool gradually. Temperatures were recorded by thermocouples at eight points on the ring.

Alloyed Sucker Rods Show Well

SUCKER rods used in pumping oil to the surface from wells have gone through various stages of evolution insofar as materials are concerned, all the way from the wooden rods employed on the original 69-foot Drake well in Pennsylvania 75 years ago to the modern heat-treated alloy rods now in use on wells 7000 to 10,000 feet deep.

B. B. Westcott and L. W. Vollmer, Gulf Oil Research & Development Corp., presented a paper before the October meeting of the petroleum division of the American Institute of Mining and Metallurgical Engineers discussing the design of, and materials for, sucker rods. An abstract of this paper appearing in the December, 1934, issue of *Nickel Steel Topics* published by the International Nickel Co. Inc., New York, contains numerous points of interest.

Wrought iron was displaced by carbon steel for sucker rods in the oil fields over 30 years ago, but in 1932 some rods made of wrought iron were put in service in West Texas, where the problem of sulphide corrosion was especially serious. About this time, some experimental work had been done in the alloying of wrought iron with nickel, and it was decided to use some 3.5 per cent nickel-iron sucker rods.

Show Improved Service

These rods were installed about 18 months ago in the Kansas sulphide fields, and a conclusive superiority over carbon steel rods was established. Just how great an improvement has resulted it is not possible to state, since the first string of nickel wrought iron rods still is giving excellent service. Some indication, however, can be obtained from the following summary of service to date of 13 strings in wells of eight different companies in Kansas:

Material	Combined service life, days	No. of failures	Ratio of failures to service life
Nickel wrought iron	3,228	40	0.012
Intermediate manganese and carbon steels	1,358	198	0.147

The altogether phenomenal results obtained by the use of nickel wrought iron rods have focused attention on the use of low-carbon, nickel alloy steels. Rods were first fabricated from nickel-molybdenum steel, S.A.E. 4615, which contains about 0.15 per cent carbon, 1.75 per cent nickel and 0.25 per cent molybdenum, about one year ago and are now obtainable from three manufacturers. Over 600,000 feet of these rods are in service and the evidence is quite definite that they are distinctly more serviceable than ordinary steel rods in sulphide wells. Perhaps their use may prove not to be restricted to sulphide fields.

As a result of the superior performance of the nickel wrought iron, sucker rods of low carbon alloy steels, which are in reality ingot irons made by steelmaking processes, are being tested extensively both in Kansas and West Texas. All of them contain not more than 0.05 per cent of carbon, and nickel in amounts around 3.5 per cent. One or two varieties contain small proportions of other alloying elements.

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PHOENIX STEEL, for unusual strength; PHOENIX "A" (steel alloy), for strength and wear; PHOENIX METAL—PHOENIX "K", for strength, wear and finish; PHOENIXLOY (uniformly hard), for flat rolling where high finish of extremely thin gauge of material is required to be free from all marks or defects. Also tube mill rolls of quality material best suited to the kind of service required; PHOENIX CHILL; PHOENIX NICKEL CHILL, for all flat rolling requiring finish.

PITTSBURGH ROLLS CORPORATION

PITTSBURGH, PA.

—Photos courtesy American Steel & Wire Co.

Bale ties by the millions of bundles are used in the nation's agricultural districts, one leading use being in the baling of hay, as shown. Inset shows a bundle of 250 ties

LARGE USES OF STEEL IN SMALL WAYS

280th Article ◆ Bale Ties

WHILE consumption of steel by agriculture is far outdistanced by requirements of several other industries, the tonnage needed in farm operation in relatively small ways is surprisingly high. Wire comprises the principal steel product used on the farm, accounting for nearly one-half the approximately 400,000 tons of all steel materials which have been produced annually the past few years for agricultural consumption.

One of the largest of the various wire markets in rural districts might appear to the average layman as seemingly insignificant, yet it amounts to tens of thousands of tons of business annually for the steel industry. This particular wire product is the bale tie, which is widely employed in holding together the bale of hay or straw after it has been compressed. These ties also are used in baling rags, paper, excelsior, sawdust and other bulk materials, but the larger portion of those produced is taken by the farmer.

Changing conditions in agriculture, particularly the decline in number of horses employed, have curtailed the amount of hay raised during recent years and have had a corresponding effect on the bale tie market, but at the same time consumption of this product has expanded among nonagricultural industries. During the past 15 years production of hay dropped about 30 per cent from its 1920 peak of nearly 88,000,000 tons, while during the same period the number of horses on farms declined almost 40 per cent. A few years ago, nevertheless, annual shipments of bale ties totaled about 4,000,000 bundles, representing roughly 50,000 tons of steel.

Strength and Flexibility

Bale ties must be made of steels that meet the requirements of the use to which they are put. They must have the requisite tensile strength to hold the bale without breaking or elongating unduly. They must be flexible so that they will conform to the bale closely and so that they can be twisted readily upon themselves in order to form the tying knot. To attain this softness and at the same time eliminate possibility of undue elongation when in service presents a fine problem in annealing. Bale ties may be made from either basic open-hearth or bessemer steels of low or medium high carbon, according to requirements.

Different styles of bale ties are used, these differing from each other chiefly in the types of their ends. The simplest style is the single loop tie which is adjustable to any size bale within its capacity by simply slipping the free end through the loop and twisting it upon the tie itself. Ties intended for bales of definite dimensions have a special formation on the ends known as a cross head. These cross heads are simply hooked over each other and the bale in expanding when released from the press locks them tight. Another dimension tie is made with a patent hook and loop, or only a straight end when it is known as a patent hook adjustable tie.

Bale ties are made in various lengths from 6 to 14 feet and in gages from 9 to 16, the most popular gages being 14 and 15. Different lengths and gages can be supplied to meet special conditions. They are shipped flat in bundles of 250.

Regional Requirements Vary

Tie requirements vary in different localities. Texas, for instance, commonly prepares 50-pound bales and uses light ties, 16 and 16½ gage, while in the North Central and New England states 14 and 15 gage are most popular for the 115 to 165-pound bales produced in these regions. For export, bales may be 155 to 160 pounds in weight and require heavier gage ties. Tie lengths of 8¼ and 8½ feet used in Texas contrast with 9 to 9½ feet sizes ordered in the North Central district. Ties for baling rags or paper usually take heavier gages, 14 or 13, because of the greater weight involved in such materials compared with hay or straw.

The largest markets for bale ties are in the hay producing states which lie in the east and west North Central areas.

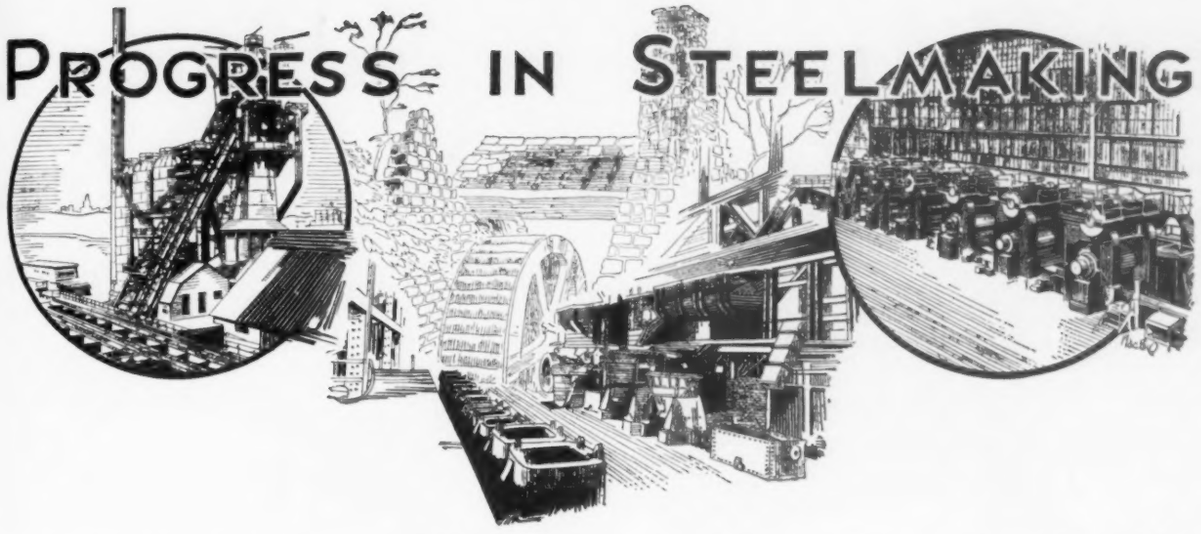
Weather Vanes Decorated With Palladium Leaf

Palladium leaf, a newly available material, is finding use in coating metal on which a bright silvery finish is desired.

In commenting on the future of palladium leaf as a coating for metals, the J. W. Fiske Iron Works, New York, since 1858 a manufacturer of ornamental metal work and weather vanes, believes it undoubtedly will supplement the use of gold leaf on weather vanes in the near future. This company states that gold leaf now finds extensive use in coating such vanes, not only because of the resistance of gold to atmospheric attack, but also because of the decorative value of gold and its property of gleaming in the sunlight.

Gold coatings also have the value of permanency, the company stating that gold leaf placed on vanes 30 years ago continues in good condition. While palladium leaf has not had the experience of time, it is expected that it will prove equally serviceable, thus adding platinum white as a practical material for decorating weather vanes and similar objects.

Coatings of this type usually are placed on bronze or copper and only occasionally on the cheaper vanes made from galvanized material.



Practice Requires Caution

If a local annealing operation is required between two deep drawing operations, precaution must be taken to prevent the whole stamping from being heated; otherwise, stretcher strains may occur in the second operation, according to a steel sheet fabricator.

• • •

Effects Reduction in Cost

By resorting to the extensive use of welding in the rebuilding of a 16-inch mill, a steel producer has effected a saving of about 25 per cent over the cost of former methods of reconstruction.

• • •

Suitable for Coal Crushers

Manganese steel because of its ability to withstand shock is claimed to be the safest for crusher segments employed at by-product coke plants for crushing the coal. Surfacing the tips of these segments with a hard facing alloy improves their life.

• • •

Electrifies Forging Units

Individually motor-driven board drop hammers appear to have taken over that field definitely, with practically all manufacturers represented with such a line, according to a large manufacturer of forging equipment. During the past few months there has been a most obvious swing to the air-actuated friction clutch for operation of all types of heavy stop-motion machines such as forging machines and presses and the displacement of magnetic clutches, toggle-operated friction clutches and metal-to-metal block, jaw and pin type clutches.

• • •

Will Install Fast Cold Mill

A tandem cold strip mill, which will operate at a higher delivery speed than any existing mill rolling the same class of material, now is being built for a Detroit steelmaker. The mill is distinguished also by the fact that the main mill motor has a greater total capacity than those on any other cold strip mills thus far built. The three roll stands in tandem each will be driven by a 1500-horsepower motor. The tension reel will be actuated by a 400-horsepower motor. Control of the mill will be of the adjustable-potential type. With this system of control, the entire mill and reel may be threaded and the strip placed under tension at the low speed, and the entire mill brought quickly up to running speed. The threading and running speeds are adjustable readily. This mill will be provided with special electric equipment for automatically measuring and regulating the tension in the steel strip between the roll stands.

• • •

Mill Is Chain Driven

STEAM DRIVE IS ABANDONED: One of the largest silent chain sprocket wheels ever made recently was installed in a Pittsburgh district rolling mill. The sprocket is 131 *inches diameter and weighs* 10 *tons. It replaced gears in a changeover to motor drives from steam. The new drive transmits* 1000 *horsepower at* 45 *revolutions per minute*

Reduces Radiation Losses

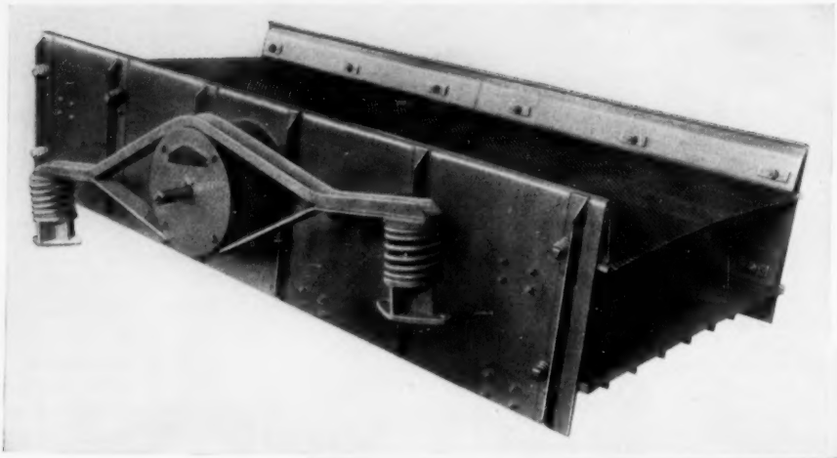
Suitable covers for galvanizing pans which will reduce the production of ash includes metal hoods, coke breeze and diatomaceous earth. One wire manufacturer in using this latter material encountered a carryover when employing a shallow pan about 1 foot deep and with the wire going down about 6 inches. At another plant silocel is used to prevent oxidation of the zinc and to reduce radiation losses to a minimum.

• • •

Internal Heat Is Removed

Water cooled motors for special equipment used in steel mills where surrounding atmosphere is of high temperature has been developed. The water cooled stator serves as a protection against outside high temperature air and at the same time removes the heat generated on the inside of the motor. A feature of this type motor is the small quantity of water necessary to remove the internal heat as well as its small cost. The water may be drained from the motor housing merely by opening a release valve.

In those dependable Robins' Screens ... *Springs are* Vanadium Steel



In the well-known VIBREX *Screen, made by Robins Conveying Belt Company, four coil springs of Silicon-Vanadium Steel carry the entire load of screen and material.*

Standard Double-Deck GYREX *Screen made by Robins Conveying Belt Company, 15 Park Row, New York City. Transverse springs are Chrome-Vanadium Steel.*

All over the world . . . wherever rock, ore, coal, coke and many other products are being screened . . . you'll find Robins GYREX and Robins VIBREX Screens. Playing an important part in the day in and day out performance of these Robins Screens are springs of Vanadium Steel.

In the GYREX heavy duty screen, for example, transverse springs of Chrome-Vanadium Steel carry a very large part of the total load of screen and material. They are subjected to severe stresses rapidly applied.

The four coil springs of Silicon-Vanadium Steel used in the VIBREX are subjected to stress reversals at even higher speeds. These springs carry the entire weight of the screen and its load. Only springs of Silicon-Vanadium Steel have given satisfactory performance in this service.

Since adopting Chrome-Vanadium and Silicon-Vanadium Steels for this very severe spring service, Robins Conveying Belt Company has entirely eliminated spring breakage.

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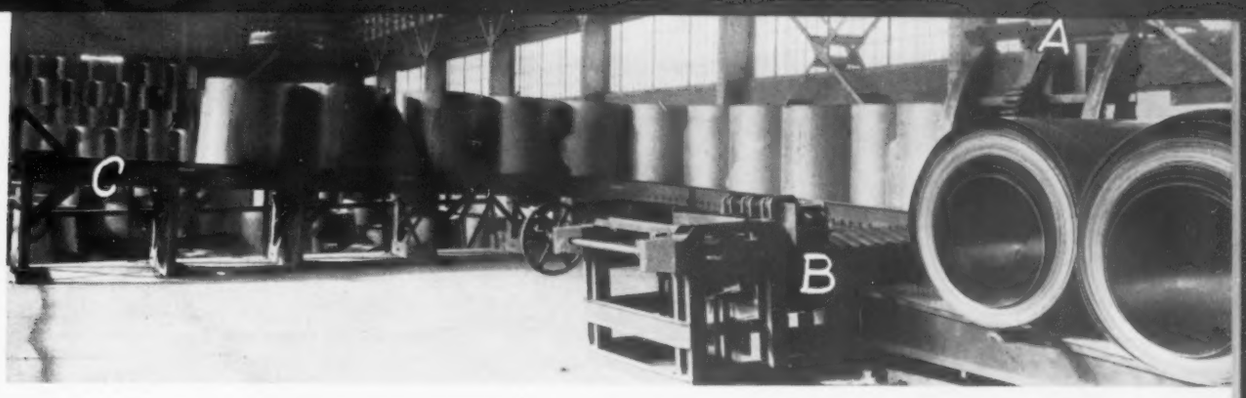


Fig.1—Coils of strip from storage are loaded by crane on the heavy-duty roller conveyor, designated "C", are upended and then fed into the continuous pickler

New Conveyor Upends Coils In Transit to Pickler

BY M. J. ANDERSON
Chief Engineer, Mathews Conveyer Co.

HANDLING strip steel in the process of manufacture always has been a distinct problem and since the development of the broad strip mill this step in the cycle of production of this particular commodity has become even more important. Not only have coils increased in width and weight, but manufacturing methods have called for the continuous dispatch of material through various processing departments. One of the most recent methods devised for handling coils of broad strip steel at the front end of the continuous-type pickler is shown in the accompanying illustrations.

Fig. 1 depicts a side elevation of the conveyor leading to the coil upender, designated "A," and tilting station, designated "B." Fig. 2 shows a coil of strip which has been turned by the upender (A), ultimately to be discharged toward the foreground on the tilting section (B), which is operated pneumatically.

The cycle of operation consists of bringing coiled steel out of storage by an overhead crane equipped with a magnet and placing it on conveyors for upending prior to being fed into the pickling machine. Coils vary in weight from 3600 to 8000 pounds each.

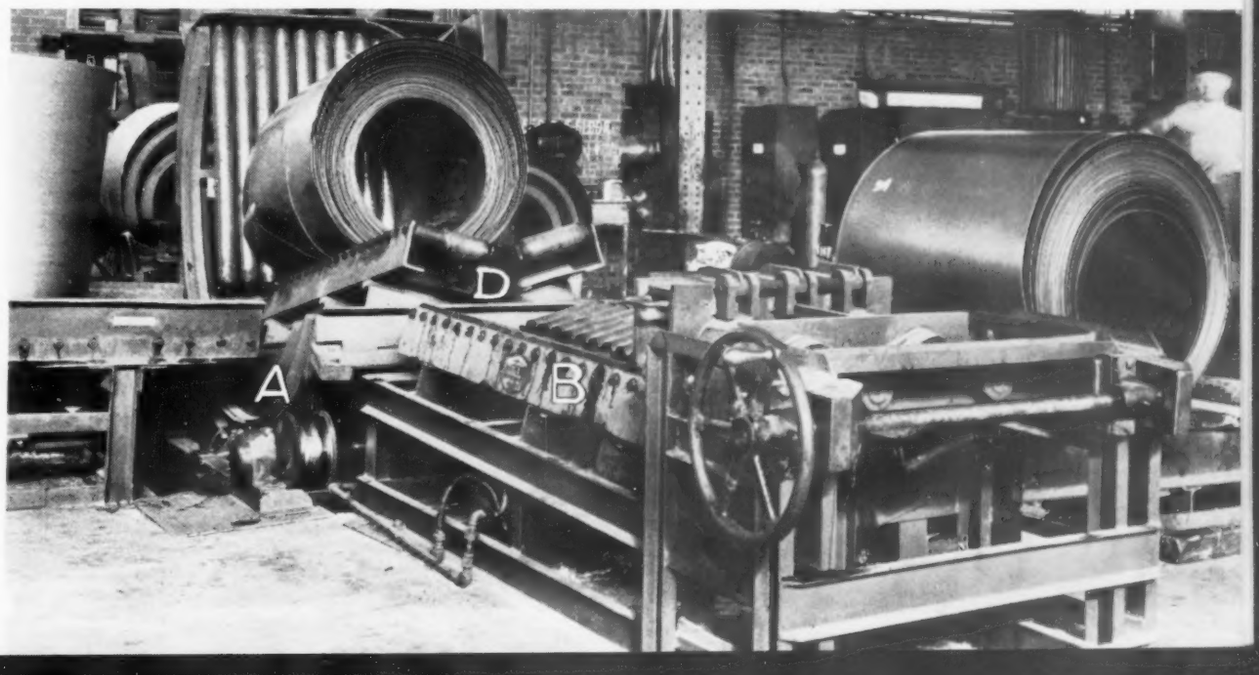
Serves as Storage

Coils from storage are deposited on the receiving end of a heavy-duty roller conveyor designated "C" in Fig. 1. This conveyor line serves as a live storage unit, the coils being fed into the upenders automatically by the actuation of electric limit switches which control power-operated stops. As the coil is received on the conveyor bed of the upender, the switches are thrown and the upender starts revolving. The coil of steel is turned on its side and becomes engaged with the service of the rollers of the troughed-shaped section, designated "D," of the upender. The heavy coil gravitates on this section of the conveyor from the upending unit to the pneumatically-operated tilting section, designated "B." The coil is brought to rest at the end of the tilting section, the impact being overcome by a spring bumper mechanism. The bumper is built with a screw adjustment to permit centering various width coils at the start of the line in order to keep them in the proper center line with the pickler.

When the coil is clear of the upending conveyor section the tilting section operates and causes the coil of steel to be discharged to a steel skid from which it is fed into the pickler.

Three installations, such as described, are in operation at a broad strip mill in this country for conveying coils of steel in maximum sizes of 44 inches diameter and in widths ranging from 36 to 72 inches. The system is the product of the Mathews Conveyer Co., Ellwood City, Pa.

Fig. 2—Coil of strip upended by unit "A" about to be gravitated on trough-shaped section "D" to the tilting section "B" and thence to the pickler



Advisory Board Completes Research in Steelmaking

EACH year since 1927 a conference has been held in Pittsburgh to discuss informally the results of the work accomplished by the Metallurgical Advisory board to the Carnegie Institute of Technology. In 1926 the board voted to undertake a five-year program on the study of the physical chemistry of steelmaking, including the study of nonmetallic inclusions, their nature, properties, methods of determination and elimination. Dr. C. H. Herty Jr. was engaged and was assigned by the bureau of mines, with other assistants from the bureau, the institute and board, to work on this general problem.

The original five-year program was completed in 1931 but the board authorized the continuation of the work for another period of three years. The new program included the refining of steel in open-hearth furnaces, strong deoxidizers, elimination of nonmetallic matter, gases in steel and quicker methods of determining inclusions.

Reports Now Available

The work involved in the three-year program was completed last year but the annual meeting was deferred until reports of the entire program were written. The reports now are available in bulletin form or may be had in a single bound volume entitled "The Physical Chemistry of Steel Making," by C. H. Herty Jr., and associates.

The foregoing constituted the opening remarks of Dr. F. N. Speller, chairman of the Metallurgical Advisory board, at the morning session of the eighth annual meeting held at Carnegie Union, administration hall, Carnegie Institute of Technology, Pittsburgh, Feb. 8. The meeting was attended by 455 metallurgists and open-hearth executives, marking the largest attendance since the inception of the board.

In reporting on the work of the metals research laboratory Dr. R. F. Mehl presented a brief summary of the progress made, pointing out that four studies are involved in the present program, namely, the plasticity of metals, precipitation from solid solution, oxidation of alloys and diffusion of alloys. Since the last conference, he stated, 12 papers dealing with the work of the laboratory have been published. Ten papers now are in the course of preparation and will be ready for distribution shortly.

In discussing the plasticity of metals, Dr. Mehl mentioned that the work required the preparation of pure iron but efforts to prepare large single crystals were not successful. He was of the opinion that a new technique must be devised. Thus far there has been little study of orientation in cold rolled steel sheets. Much of the work done on steel sheets by X-ray has not been trustworthy. Dr. Mehl recommended that a wide study of orientation be undertaken by steel companies.

Other papers presented at the morning session included "Final Report on the Constitution of Iron-Manganese and Iron-Manganese-Carbon Alloys" by Dr. F. M. Walters Jr.; "Preparation and Properties of High Purity Iron," and "Constitution and Behavior of High Purity Iron-Carbon Alloys," by Dr. Cyril Wells; and "Effect of Deoxidation on the Aging of Mild Steels," by B. N. Daniloff.

In discussing the latter paper, Dr. V. N. Krivobok pointed out that Dr. Herty and Mr. Daniloff have shown conclusively the pronounced effect of deoxidation on aging of mild steels. The explanation of the observed phenomenon is by no means simple and it is yet to be determined exactly what are the most potent factors, he stated. The report, he continued, states the sample received uniform normalizing treatment prior to aging experiments. No information, however, is given as to the characteristics of various steels immediately after normalizing, such as, for example, grain size which may have a considerable influence on the final results of age-hardening. In this connection, Dr. Krivobok mentioned the work of Mr. Sohnchen of Germany who found definite relationship between the grain size and the hardening, showing that the decrease in grain size resulted in the increase in the amount and rate of precipitation hardening. So many astounding things have been learned recently pertaining to the influence of grain size on properties and characteristics of carbon and alloy steels that its influence on age-hardening must be considered. This consideration alone, he suggested, may be responsible for certain inconsistencies in experimental results which otherwise are difficult to explain.

At the afternoon session Dr. Herty reviewed bulletin No. 67 of the Metallurgical Advisory Board, entitled "The Effect of Deoxidation on the Impact Strength of Carbon Steels at Low Temperature," which deals largely with temperature impact properties of plain carbon steels between room temperature and —110 degrees Fahr.

Silicon Content Varies

In commenting on this paper A. B. Kinsel, chief metallurgist, Union Carbide and Carbon Research Laboratories Inc., New York, pointed out that the superiority of the thoroughly killed steels is definitely shown. It may be significant, he said, that the best of these steels contains not only a small amount of nickel, but also 0.15 per cent silicon. This amount of silicon is normal in steels of this character, whereas the other mild carbon killed steels listed, contain only approximately 0.08 per cent silicon which is distinctly subnormal. In the same connection the heat selected to illustrate a mild steel killed with silicon and to which no aluminum has been added contains only 0.11 per cent silicon, which in the opinion of many is not sufficient for the purpose. It may well be that a more suitable silicon content in this heat would modify the conclusions. This is particularly true in view of the lack of difference between the aluminum-killed and the silicon-killed medium-carbon steels.

That the grain size is important has been shown. Aluminum in the amounts used is recognized as a grain refiner as well as a deoxidizer, and the two effects are not readily separated. This leads to the thought that vanadium may be even more effective than aluminum in preserving the low temperature impact strength, he concluded.

In discussing bulletin No. 65 entitled "Rate of Transformation and Grain Size" and dealing particularly with the effect of three common deoxidizers—manganese, silicon and aluminum, Philip Schane Jr., chief metallurgist, Duquesne works, Carnegie Steel Co., Duquesne, Pa., em-

New Members

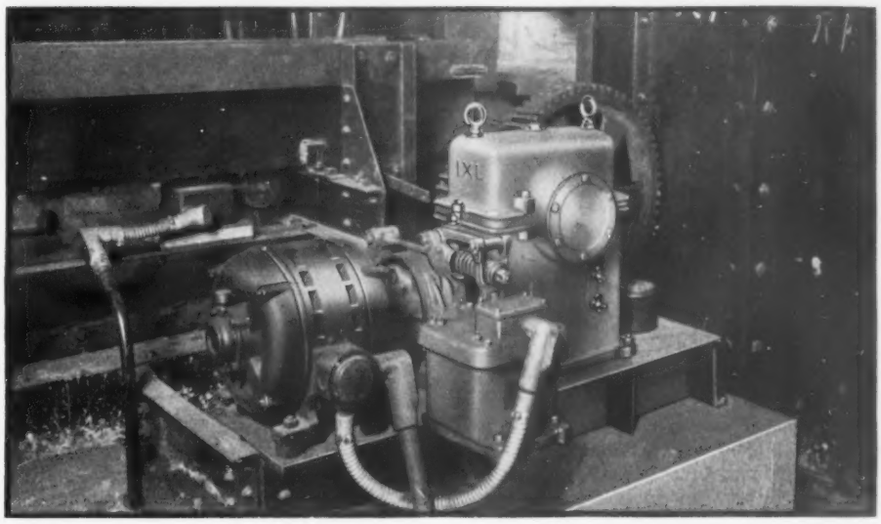
METALLURGICAL ADVISORY BOARD TO THE CARNEGIE INSTITUTE OF TECHNOLOGY

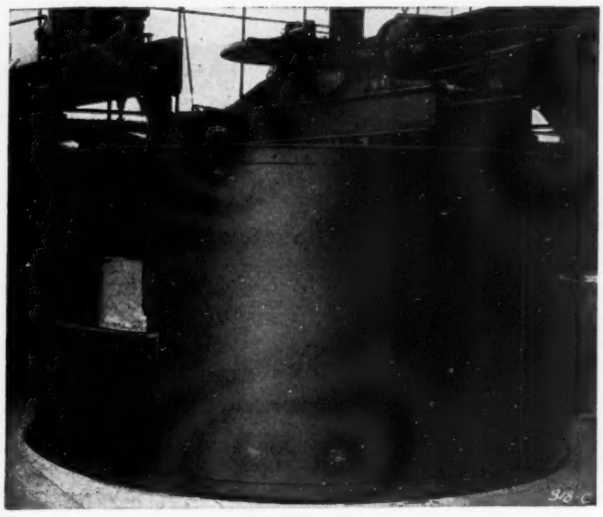
J. F. Casey,
President, John F. Casey Co.
Aspinwall, Pa.

S. M. Kittner,
Director of Research,
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

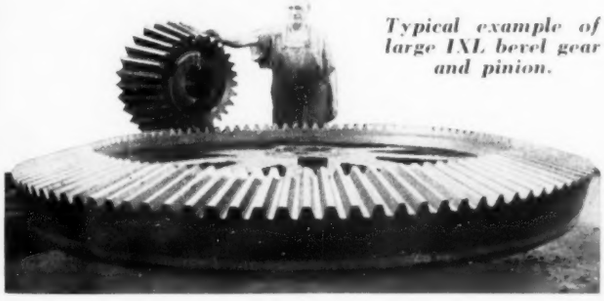
C. H. Herty Jr.,
Research Engineer, Bethlehem Steel Co., Bethlehem, Pa.

Look for THIS IXL MARK on SPEED REDUCERS and GEARS of all types





IXL reducer driving mechanism of a rotary annealing furnace.

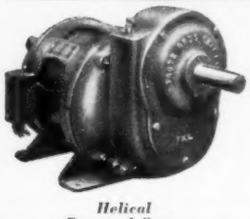


Typical example of large IXL bevel gear and pinion.

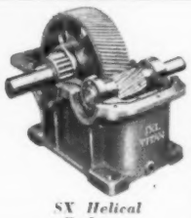
STEEL MILL shutdowns are tremendously expensive and steel mill drives must therefore be dependable. You take no chances when you select IXL speed reducers and gears. They are built of the finest steel and other materials and are characterized by heavy, rugged construction, adapted for shock load and the continuous service found in steel mills. They are rated according to recommended practice of the A.G.M.A.

There is an IXL unit for every steel mill and metal-working requirement. There is 75 years of manufacturing and gear designing experience back of this line. There are specialized engineers ready to work with you in adapting exactly the right drive to your equipment.

Our 664-page designer's handbook is filled with rating tables and selection data to help you with any problem involving gearing. The A.G.M.A. recommended ratings for speed reducers are also available. These up-to-the-minute helps sent free to any operating man, designer or executive. Ask for your copy.



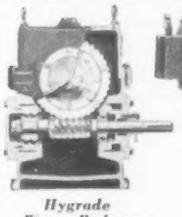
Helical Powered Gear



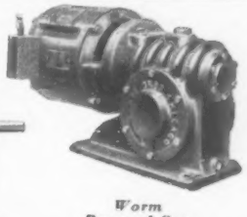
SX Helical Reducer

Foote Bros. GEAR AND MACHINE CO.

5311 SO. WESTERN BLVD. CHICAGO, ILL.



Hygrade Worm Reducer



Worm Powered Gear

phasized that for the satisfactory control of grain size and to insure uniformity throughout the heat from the first to the last ingot, it is necessary to standardize practices and furnace and ladle additions within certain limits. When conditions are outside these limits, he explained, duplex structures or variations are liable to occur, especially in the last ingots poured.

As to the conclusions drawn by Dr. Herty in this bulletin and the theory of grain size control, Mr. Schane was of the opinion that sufficient evidence has been presented to prove that a dispersion of nonmetallic matter is responsible. This point now is being questioned by many metallurgists, he stated. However, the important point stressed by Mr. Schane is that commercial control or grain growth tendencies has been accomplished. With this control better knowledge of making carbon steels, greater uniformity and regularity in subsequent fabrication and heat treatment are the much desired results.

At the informal dinner held in the evening at the University club, J. Steele Gow, director, Falk Foundation, Pittsburgh, spoke on "Research in the Economic Field". F. N. Speller, chairman of the Metallurgical Advisory board, in his closing remarks, announced that the board would continue to function and despite the fact that the study of physical chemistry of steelmaking started in 1926 has been brought to conclusion, the annual get-together meetings of the board will be continued. The work accomplished by this study, he stated in conclusion, has effected an improvement in the quality of open-hearth steel and a reduction in cost of manufacture.

The first copy of the volume entitled "The Physical Chemistry of Steelmaking" with a special binding was presented to Dr. Herty Jr. as a token of appreciation for his tireless work in making this data possible.

Stainless Steel for Dairy Equipment

(Concluded from Page 44)

where it eventually fails, and the first thing the fabricator does is to tell the customer that the material is no good.

This is all wrong. Most material produced by reliable steel companies in the past three years has been the finest that could be obtained. Great benefits could be gained by the stainless steel producers if they furnished material to qualified fabricators only, or at least assisted new ones so that the equipment produced would be satisfactory. Every piece of equipment which fails is a "black eye" for the entire industry.

Work Strains Cause Trouble

Many failures still occur in stainless steel equipment today. One essential is to lay out designs to avoid work strains which develop rapidly with the use of stainless steel. If these work strains are not eliminated in the course of fabrication, nine chances out of ten are that this equipment will fail, inasmuch as expansions and contractions are much greater with stainless steel than with most other types of materials which have been used for sanitary equipment. Furthermore, in order to produce successful equipment, it is to the advantage of the steel producing companies to insist on a certified analysis rod for welding, with the proper kind of coating. Many welding rods on the market today are not approved by any steel company, and some trouble must arise on this account.

The writer therefore believes that steel companies should co-operate with each other, and also with both the consumer and the fabricator in order to reap the benefits which the stainless steel material itself has to offer.

Some years ago the writer was called by one of the large dairy companies to give their engineer an opinion on certain uses of stainless steel. This engineer was an intelligent and conservative man. After answering all questions regarding the characteristics of the material and the like, the writer advised him that stainless steel is the only thing besides whiskey which will improve with age.

Just recently, the writer's company built one of the largest stainless tanks ever constructed for use in fermenting yeast. The tank is 18 feet in diameter, 24 feet high and has a capacity of 38,000 gallons. The illustration on Page 44 shows the tank in service—looking in with the cover off.

Develops Porcelain Enamel Process

A NEW type of porcelain enamel process, claimed to achieve a great degree of opacity and therefore depth of color, in two coatings and firings, has been developed recently and will go into commercial use in the near future. The process, developed through the joint efforts of Dr. J. E. Rosenberg, director of research, O. Hommel Co., Pittsburgh, and William J. Baldwin, incumbent of the industrial fellowship established by that company at Mellon Institute of Industrial Research, Pittsburgh, will be known under the trade name of "Hommelaya." Patents have been granted or are pending in the United States and foreign countries.

Two Coatings on Light Tints

White or pastel tints of porcelain enamel are heavily demanded for a wide range of manufactured products and up to the present three successive coatings and firings of the enamel sometimes are necessary. A product coated with the new enamel will require only two coatings, it is stated. The third coating, necessary under the present practice of using a blue ground coat, is applied only to obtain the required degree of opacity and adds nothing to the strength or wearing quality of the product.

Most enameled products have sheet steel as the base material. In enameling, the steel is immersed or sprayed with a frit which is a form of glass, finely ground and suspended in a liquid. When the liquid has evaporated, leaving the frit evenly deposited on the metal, the product is fired. The problem is to produce a firm bond between the ground coat and the steel and this is accomplished by the addition of chemicals which act similarly to a flux in welding metals.

Brighter Ground Coat

Through the action of these chemicals under present method, the ground coat is either black or very dark blue, and two additional coatings and firings may be needed to prevent the dark ground color from showing through and altering the surface color. With the new process, a white or a light color can be obtained in the ground coat, and therefore only one additional coating and firing is needed to provide a true color tone.

Success of laboratory experiments has been confirmed by use of the process under actual industrial conditions in several manufacturing plants. According to Dr. Edward R. Weidlein, director of Mellon institute, the new process meets or improves enameling standards. Advantages of the process are claimed as follows: (1) A product which is less liable to craze or chip because of the thinner coating; (2) a saving in cost of materials per unit; (3) a decrease per unit in fuel and labor costs incidental to firing; (4) an increase in productive capacity of present kiln equipment; and (5) a smaller number of rejected units through elimination of the hazard of a third firing.

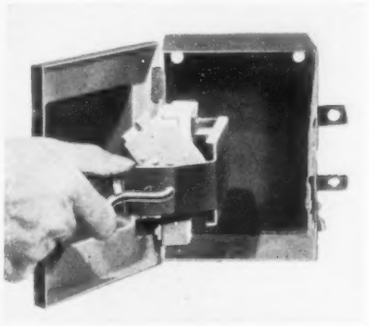
NEW EQUIPMENT

Swing-Out Interior Switch—

Square D Co., Switch & Panel Division, Detroit, is introducing a new line of type D 30-ampere switches with a novel swing-out interior, which is said to appreciably reduce the time and cost of wiring. A major feature is the fact that the base and operating mechanism are mounted on a metal supporting plate which is hinged to the side of the box. By pulling on the operating handle, the entire interior swings out and away from the box, leaving the box area open for unobstructed wiring and conduit connections.

With the wire and conduit in place it merely is necessary to swing the interior back into place and the connections can be made. The hinged interior is self aligning. The handle slipping into the slot at the side of the switch automatically brings the interior into place and retains it there. The interior may then be secured by a single set screw. Compact size of the interior gives plently of room for grounding bushings in all knockouts. The hinged support is elevated from the back of the box to provide ample space for laying wires behind the base without pinching the wires.

Other features of this new line of



New Square D switch embodies swing-out interior

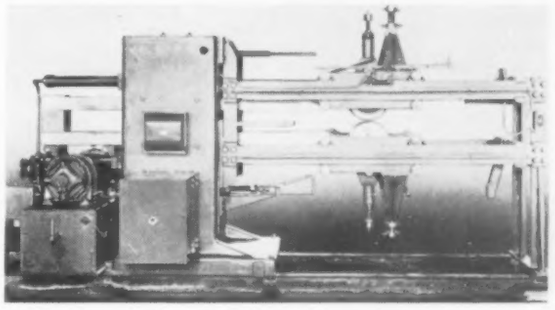
switches include knockouts to align with standard Square D fuse cabinets and socket type motors. Switches with end walls with standardized motor twist-outs are available also. Additional features includes one piece combination jaw and connectors, eliminating the possibility of loose connections and backed by the porcelain base to prevent turning, and ensuring perfect alignment of the switch blades.

• • •

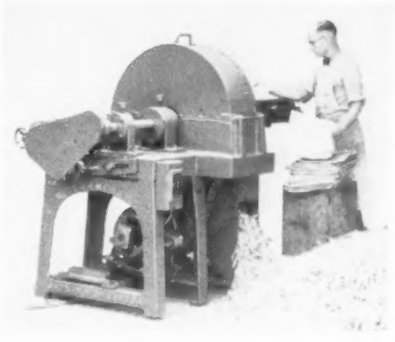
Paper Excelsior Shredder—

Mitts & Merrill Inc., Saginaw, Mich., recently placed on the market a new type of machine for

Right — Thomson-Gibb special seam welder for extra wide sheets



Below—Paper excelsior shredder built by Mitts & Merrill Inc.



shredding newspapers, magazines, oiled, waxed or tissue paper, cellophane, etc. to be used in packing. The paper to be shredded is laid on a conveyor belt and is carried to the knives of the machine, shown herewith. The cutting operation is continuous. Feed being constant, a slight curve and warp are imparted to each strand of excelsior. The cut paper is thrown endwise at high velocity into a discharge spout. Contact of the paper with the air separates the warped strands completely, thus producing a resilient mass of shreds or excelsior. Standard shredding machines are arranged to cut widths from ⅛ to ⅜-inch.

• • •

Special Seam Welder—

Thomson-Gibb Electric Welding Co., Lynn, Mass., recently designed a resistance welder, shown herewith, to simplify the problem of welding together extremely wide sheets of metal. While seam welders operate in many ways, they are usually designed so that the work passes between stationary welding rolls or a traveling welding roll moves the length of the seam over a copper mandrel. The first type is used only when the work is easy to handle; the second has a limit beyond which the arm or mandrel cannot be extended, the company explains.

This wide sheet seam welder is designed to handle work which does not conform to the limitations of either of these types. It employs two traveling welding rolls which provide the contact above and below the seam. The problem of connecting the traveling rolls to the transformer was overcome by making them an extension of the transformer secondary. When the machine is in operation, the entire unit consisting of the transformer secondary and welding wheels travels the length of the seam propelled by an oil gear.

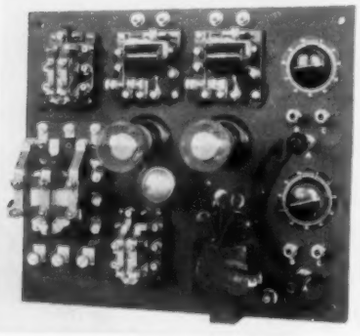
• • •

Automatic Repeat Timer—

Electric Controller & Mfg. Co., Station C, Cleveland, recently developed an automatic repeat process timer for use in connection with a wide variety of electrically-operated devices and machines requiring automatic timing of the "power-on" and "power off" periods. The timer is built in four standard sizes and is designed for operation on 110, 220, 440 or 550-volt circuits of any standard frequency. Operating on the principle of the time required to charge a condenser, it provides a quick, convenient means for closing an electrical

circuit for a definite length of time, and then opening the circuit for a similar, or different time, as desired, and repeating this cycle of operation as long as the control push button or master is closed. Both the "power-on" and the "power-off" periods are independently adjustable to give the time desired.

The "power-on" period can be adjusted from .05 seconds minimum to .90 seconds maximum on the smallest size of timer. The "power-off" period of this same size timer is adjustable over a similar range of time. With both the "power-on" and "power-off" periods set at minimum time, the timer will provide 550 operations per minute. With the largest size of unit the "on" and "off" periods are adjustable between a range of .12 seconds minimum and 7.5 seconds maximum. Timers, of course, could be supplied with a different range of time for the "on" period than is supplied for the "off" period.



EC & M automatic repeat process timer removed from cabinet

The accompanying illustration shows this timer with its two independent adjusting dials for each circuit. The unit as shown, has been removed from its enclosing cabinet.

♦ ♦ ♦

Wet Abrasive Cutting Unit—

Andrew C. Campbell Division of American Chain Co. Inc., Bridgeport, Conn., recently added to its line a model 302 horizontal wet abrasive cutting machine. This unit, shown herewith, is designed primarily for making long cuts through flat or slab stock but bar stocks can also be cut. A unique hydraulic feed mechanism permits the abrasive cutting of larger sizes of flat material than have heretofore been considered practical. The hydraulic feed can be regulated for speed of feed with infinite variations between the maximum and minimum rate, a feature that is of prime importance when cutting glass or other fragile materials and to obtain best wheel life in cutting steels.

Cutting is done by a revolving thin abrasive disk to which is applied a continuous and uniform application of a liquid coolant. Danger to workmen because of dust and grit laden air is eliminated, according to the manufacturer. This is important from the standpoint of safety and reduction of industrial hazards. Among the wide variety of flat materials that can be cut on the machine are glass, porcelain, brick, stone, tile, steel, copper, cast iron, hardened steel and alloys of all descriptions.

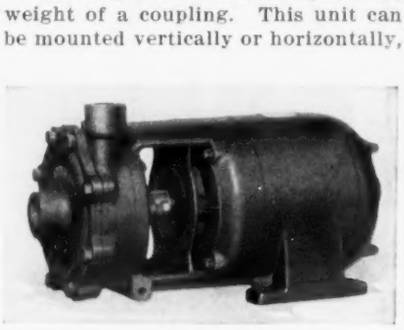
Campbell horizontal wet abrasive cutting machine designated model 302

♦ ♦ ♦

Centrifugal Pump—

Worthington Pump & Machinery Corp., Worthington avenue, Harrison, N. J., recently announced an advanced development of its two-stage centrifugal pump. The unit, shown herewith, is applicable to all services requiring small capacity and medium discharge head. The casing, designed to withstand 150 pounds pressure, is bolted directly to the motor frame without an intermediate distance piece, thus eliminating the necessity for a baseplate.

Attention is drawn particularly to the unique impeller design, which is a unit construction consisting of two enclosed type impellers cast back-to-back, so that the overhung weight is actually no greater than that on a single stage pump. The impeller, which is keyed, is held firmly to the shaft by an impeller nut and the shaft sleeve also keyed, is a separate, renewable part. Impeller is mounted directly on the motor shaft, eliminating the additional space and weight of a coupling. This unit can be mounted vertically or horizontally,



Worthington centrifugal pump for horizontal or vertical installation

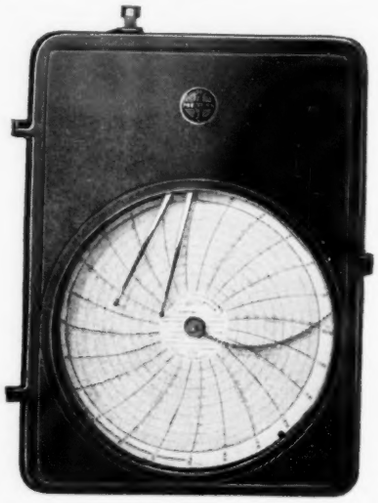
with satisfactory performance in either case. The pump has steep head capacity characteristics.

♦ ♦ ♦

Improved Instrument Case—

American Meter Co. Inc., 60 East Forty-second street, New York, has announced that the type W case, shown herewith, now is standard for its entire line of recording and integrating flow and orifice meters, rate-volume controllers, liquid level indicators and controllers. Simple lines and velvet black finish are in keeping with the high standards for both instrument and panel board design.

Case body and door are cast of an aluminum alloy with attention to the construction of door hinges and hinge pins, which are produced from special alloys to minimize the possibility of corrosion. A sponge rubber gasket secured in a recess of the door makes the case moisture and dust proof. Both time and labor are saved in the necessary inspection of the instrument by making the chart dial



American Meter Co. has adopted this instrument case as standard

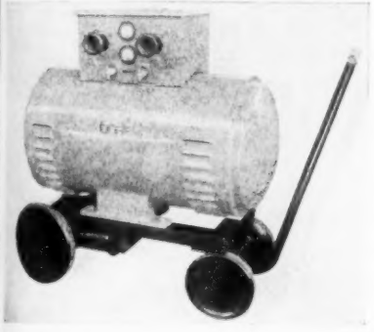
size such that the pressure spring, stuffing box and other working parts are visible when the door is open. The new case is satisfactory for flush mounting. For that type of installation a flange is cast integral with the case, the door being hinged to the flange.

For the flow control instruments, the type W case has the air supply gage, and the gage indicating the pressure on the diaphragm head of the control valve, mounted on brackets secured to the inside of the case. The door is provided with two additional round windows, making these gage indications visible at all times. The construction here also facilitates flush mounting since all air connections are behind the panel board and are made into flanges secured to the sides or back of the case.

♦ ♦ ♦

Arc Welder—

Ideal Electric & Mfg. Co., Mansfield, O., has placed on the market a new design of electric welder featuring an extremely fast arc with almost incredible recovery speed. A unique arrangement of generator windings utilizing a separate auxiliary differential field structure produces an improvement in welding performance. Oscillograph tests show recovery from short circuit to normal welding current in less than



Arc welder developed by Ideal Electric & Mfg. Co. unique in design

1/1000 of a second. Also, this welder, shown herewith, will maintain its current and voltage settings when started up cold and run full load for any period desired. Temperature rise of the machine has no effect on the current and voltage settings in this welder.

The new machine provides both 35 and 40-volt operation by a simple adjustment of the controls, permitting the use of the new improved high speed coated rods as well as standard uncoated rod, and also allows copper arc and carbon electrode work, all on the same machine. Other features include all-steel welded construction, a dual control system for both voltage and current control, polarity reversing switch and zero center individual current and voltage meters. Drip-proof covers are provided which upon removal permit easy access to all parts of the machine. Another exclusive feature is the automatic brake which holds the welder from rolling when the pulling handle is lifted. These units also are available for direct current motor drive, and engine drives with all the features of the regular alternating current driven machine.

♦ ♦ ♦

Blueprint Machine—

Milligan & Wright Co., 4711 Prospect avenue, Cleveland, recently brought out a blueprint machine which utilizes the new Angstrom blueprint lamp of the incandescent type. It operates from the regular 110-115 direct or alternating current

Milligan & Wright blueprinter utilizes Angstrom lamp

lighting circuit without the need for transformer choke coils or similar equipment. The lamp differs from the ordinary incandescent lamp in the quality of light produced, being stronger in the blue end of the spectrum.

The model 100 machine, shown herewith, is the portable table type which will print one 18 by 24 or two 12 by 18 or four 9 by 12 prints at one time. To make a print it is only necessary to place the tracing and paper on the plate glass top, lower the pressure pad and close the cover. The springs in the cover act on the pressure pad to assure good contact between tracing and paper. An automatic time switch is set for the time of exposure. The print is dried on a special drying board furnished with the machine.

♦ ♦ ♦

Compensated Air Hose—

Manhattan Rubber Mfg. Division of Raybestos-Manhattan Inc., Passaic, N. J., recently brought out a new air hose, in the construction of which the unequal ply stresses set up in the wall of the hose by longitudinal and lateral tension incident

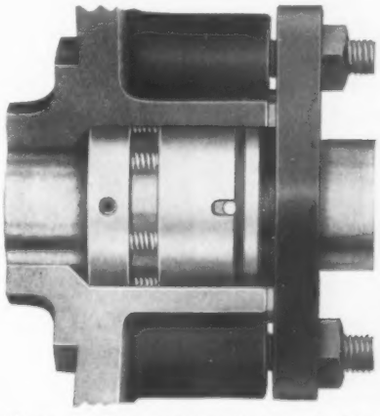
with operation, are compensated and made equal. This is accomplished solely within the unique construction, which consists of two strength members, a braided cord member for longitudinal stresses, and a spiralled strength member for expansion and lateral stresses, both welded in tough age-resisting rubber. By this balanced construction, internal friction and chafing are eliminated. According to claims it effectively resists surge and pulsation.

♦ ♦ ♦

Mechanical Seal—

Durametallic Corp., Kalamazoo, Mich., has developed an effective mechanical seal for centrifugal and rotary pumps. The design is particularly useful where gritty or corrosive liquids and gases are present. It can be applied to ordinary stuffing boxes. The accompanying illustration shows an inside assembly of this new type of stuffing box, which is suitable for use against light thin fluids having a pressure of 30 pounds or more and heavy fluids having a pressure of 60 pounds or more.

A wide variety of metals and other materials may be used in the construction of the new seal for resistance against corrosion by practically all chemicals and so that grit cannot get between the seal ring and the face of the bushing or gland.



Durametallic mechanical seal for centrifugal and rotary pumps

Automatic Alternating Current Arc Welding of Class 1 Pressure Vessels

(*Concluded from Page* 33)

by requiring more weld metal deposit, which also reduces net welding speeds. Narrower angles tend to produce undercutting of the bottom layers of weld metal, thus entrapping slag and increasing the effort required in cleaning between passes and in repairing defects detected by the X-ray.

The first welding operation is the longitudinal seam. The tabulation in Table I gives the plate thickness, type of bevel, U or V, and its dimensions and the number of layers or passes. Table II gives typical welding data and includes the electrode type and diameter per pass, the corresponding welding current, arc voltage, welding speed, wire consumption, and oscillation amplitude and frequency. This data applies to circumferential seams and is irrespective of vessel diameter or length.

Welding and Relieving Procedure

The order of procedure is to weld the groove full, including reinforcement at the top, then chip off the backing-up strip and reweld the back of the groove by hand, filling in the weld metal that was removed in chipping off the backing-up strip, and reinforcing the weld on the back. Welding layers average ⅛-inch in thickness and reinforcement extends above the plate surface the amount required by the boiler code. This reinforcement is chipped off on all fired pressure vessels or when the customer requires it to be done on other vessels.

Cleaning between passes is accomplished by loosening the slag with a hooked instrument much like a pinch-bar. The chips are blown out and the oxides and spatter are removed from the sides of the groove with a pneumatic tool. The weld is then cleaned by hand with a wire brush.

The welding transformer for the automatic machine is rated at 750 amperes for 1 hour or 575 amperes continuous, 40 volts secondary. For hand welding 500-ampere transformers are used. No power factor correction is applied as other plant equipment provides sufficient corrective kilovolt amperes in synchronous motor drive. Phase balancing is sufficiently well taken care of by distribution of the single phase units on the 3-phase system.

After welding, the test plates are removed and all seams are marked with the usual lead identification markers, for X-ray examination. Fig. 2 shows a typical shell, before removal of the test plates and with markings for X-ray examination. Every seam is examined with a General Electric X-ray machine equipped with a 300,000-volt tube. Fig. 3 shows the X-ray machine in position for examining the circumferential seam of a vessel. This machine is of the most modern type and is mounted on a special truck for ready portability.

Defects when found are chipped out, rewelded and X-rayed again. Permanent record is kept of every inch of welded seam. To date, this company has automatically welded and X-rayed 1400 linear feet of welded seams and has found 0.04 per cent of defects which have been completely eliminated before completion of the vessels. This remarkable record is particularly notable when it is known that all the defective welds are considered to have been due to imperfect plate edge preparation. This company states that when it has eliminated defective grooving it expects practically to eliminate the small number of weld defects that are now being encountered.

The test plates are the first to be X-rayed. They are then removed and while the vessel itself is being examined, these samples are stress relieved in a small electric furnace under exactly the same conditions that will be applied to the entire vessel. These conditions are accurately controlled and recorded for duplication on the vessel. Physical tests are then made and the check tests of the seam are completed before the vessel is ready for the furnace. No case has yet been found in which the physical tests fail to meet all the code requirements.

Properties of Weld Metal

Average physical properties obtained on A.S.M.E. S-1 boiler plate after stress relieving at 1200 degrees Fahr. are as follows:

Ultimate tensile strength, pounds per square inch	65,000
Yield point, pounds per square inch	54,000
Elongation, 0.505-inch specimen, per cent in 2 inches	31
Elongation, free bend, per cent	52
Specific gravity	7.825
Impact, Charpy, foot-pounds	33

After X-ray inspection, the complete shell is placed in a butane gas fired furnace, shown in Fig. 7, which will accommodate vessels up to 14 feet in diameter and 30 feet long. The butane storage tank, located outside the building, is a Class 2 vessel, also welded with the equipment and process described. Strain relief annealing consists of heating to 1200 degrees Fahr. and maintaining this temperature for 1 hour per inch of maximum thickness. The work is then cooled to 500 degrees Fahr. in the furnace. Three hours are required to raise the vessel from room temperature to 1200 degrees Fahr. and 5 hours to cool to 500 degrees Fahr.

Hand welding of fittings is done with General Electric type W-23 electrode and alternating current. The work is positioned for this operation insofar as possible, although the electrode used will produce Class 1 welds in any position with alternating current. Fig. 4 shows a typical vessel with the hand welded fittings being attached.

Welders Like Automatic Method

Automatic welding has proved so satisfactory at this plant that in every case in which it is possible to do so hand welding has been eliminated. Fig. 1 shows the adaptation of two heavy flanged heads for the automatic welder. These four circumferential seams formerly were hand welded due to the difficulty of mounting the heads on the automatic unit. They are now temporarily welded together as shown to take advantage of the greater economy and uniformly high quality obtainable from automatic welding.

Experience of the Foster Wheeler Corp. is that the alternating-current automatic equipment gives somewhat greater net welding speeds than could be obtained with direct current equipment; and fewer defects to be chipped out. In hand welding, excepting with low current values, the operators like the alternating current arc to handle. These operators were originally trained on direct current and, without exception, express preference for alternating current because of the ease with which it may be handled.

New Trade Publications

RHEOSTAT—Udylite Co., 1651 East Grand boulevard, Detroit, presents its rheostat, with illustrations and pointers on these devices and their uses.

WELDING — Lincoln Electric Co., Cleveland, has issued plate No. 47 of studies in structural arc welding, devoted to arc-welded tier buildings. It is illustrated by diagrams.

DIAMOND WHEELS—Norton Co., Worcester, Mass., his issued a booklet on its diamond wheels for grinding and lapping cemented carbides and hard, brittle materials. It is well illustrated.

JOURNAL JACK—Duff-Norton Mfg. Co., Pittsburgh, in bulletin No. 516 presents its standard journal jack for lifting and adjusting low-set loads. Illustrations explain its construction and operation.

VALVES—Reading-Pratt & Cady Co. Inc., Bridgeport, Conn., has issued catalog No. 859 on bar stock valves of various types and materials for varying uses. Another booklet covers its regrinding globe and angle valves.

Softer Tone in Market; Ingot Rate Off to 53

Finished Steel and Pig Iron Shipments Still Sustained, and Automobile Production Is Up—Producers Seek To Hold Prices for Second Quarter

ALTHOUGH steel ingot production last week dropped 1½ points to 53 per cent, consumption of finished steel apparently has not yet made a corresponding decline.

Sheet mills continue operating at 70 per cent, strip mills at 65. Tin plate mills are down 15 points to 70 per cent. Shipments to automobile, agricultural implement and many miscellaneous manufacturing interests are well sustained. Pig iron producers have specifications for more tonnage in the 28 days this month than in the 31 in January.

The reaction in raw steel output following a rise from 28 per cent to 54½ per cent within nine weeks is not disconcerting to steelmakers, who did not expect the improvement to carry up to the year's peak in one continuous sweep.

Production has been scaled down to conform more closely to demands on finishing mill capacity, in line with a conservative inventory policy. Consumers have placed practically all the material they will require this quarter, and under the steel code orders for second quarter cannot be accepted until March 1.

Prices were the subject of a lengthy discussion last week, with the prospect that the most to be expected from the standpoint of producers is that present levels will be continued when announced this week.

Automobile Schedules Up for February; Railroad Decisions May Affect Markets

Automobiles are being sold almost as fast as they can be made, and the margin between output and dealers' stocks now is abnormally small. Last week 82,000 units were built, nearly 4000 more than in the preceding week. February schedules call for 375,000, and March is expected to top 400,000. January's 306,000 units in the United States and Canada was the largest for that month in ten years, excepting 1929 and 1926. Ford's world production was the highest for the month in six years.

Steelmakers look forward to early clarification of several national issues, important to the market's future. First, is the gold-clause case, the uncertainty of which is advanced by many consumers as a reason for their delaying purchases. Final action on railroads' petition for a 10 per cent increase in freight rates is anticipated in March or April, and the Supreme Court's decision on railroad pensions also is expected shortly.

On the labor front also there are some uncertainties, and small strikes in metal-working plants increased last week. Out of the civil war which the Amalgamated association has been plunged by demand from the rank and file group for more aggressive action may possibly grow a program by the American federation itself to organize steel. But in Washington it is believed there will be no general strike in either this or the automobile industry this spring, but sporadic drives at vital centers.

Railroads, whose major activities are in abeyance for the present, are ordering considerable material for repairs. Freight car awards were the best in some weeks, the Northern Refrigerator Co., Grand Rapids, Mich., placing 500 refrigerator cars, and Cincinnati, New Orleans & Texas Pacific 300 steel and wood box cars. Virginian is inquiring for 2000 tons of rails.

53,000 Tons of Structurals for Triboro Bridge To Be Bid Shortly; 10,000 Tons for Dam

In the aggregate, railroads' orders for structural material for small bridge repairs and replacements are heavy. The Pennsylvania has applied for PWA funds to eliminate 40 New Jersey grade crossings. Structural shape awards, 12,535 tons, compared with 20,305 tons in the preceding week.

For suspended spans and viaduct approaches to the Triboro bridge, New York, bids will be taken March 1 on 33,000 tons of shapes, and plans have been completed for 20,000 tons additional for the superstructure. Bids go in April 1 on 10,000 tons for the Alton, Ill., dam. The navy has awarded 1440 tons of armor plate.

STEEL's London correspondent cables British output of steel ingots and castings in January was up 16 per cent to 757,800 gross tons, and pig iron up 1.5 per cent to 521,200 tons.

Pittsburgh steelworks operations last week dropped 5 points to 39 per cent; Chicago 4 to 63; Cleveland 5 to 77; Wheeling 3 to 87. Detroit held at 100; eastern Pennsylvania 31; New England 63; Buffalo 45. Birmingham advanced 23½ to 55½, and Youngstown 2 to 60.

STEEL's iron and steel price composite is reduced 2 cents to $32.54 by a reduction in compressed sheet scrap at Detroit; the finished steel index holds at $54, while the scrap composite is up 10 cents to $11.75 on an increase at Chicago.

COMPOSITE MARKET AVERAGES

	Feb. 16	Feb. 9	Feb. 2	One Month Ago Jan., 1934	Three Months Ago Nov., 1934	One Year Ago Feb., 1934	Five Years Ago Feb., 1930
Iron and Steel	$32.54	$32.56	$32.56	$32.58	$32.15	$31.30	$34.92
Finished Steel	54.00	54.00	54.00	54.00	54.00	51.10	55.03
Steelworks Scrap	11.75	11.65	11.65	12.03	9.82	11.72	14.42

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

A COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Feb. 16, 1935	Jan., 1935	Nov., 1934	Feb., 1934
Steel bars, Pittsburgh	1.80c	1.80c	1.80c	1.75c
Steel bars, Chicago	1.85	1.85	1.85	1.80
Steel bars, Philadelphia	2.09	2.09	2.09	2.04
Iron bars, Terre Haute, Ind.	1.75	1.75	1.75	1.60
Shapes, Pittsburgh	1.80	1.80	1.80	1.70
Shapes, Philadelphia	2.00½	2.00½	2.00½	1.90½
Shapes, Chicago	1.85	1.85	1.85	1.75
Tank plates, Pittsburgh	1.80	1.80	1.80	1.70
Tank plates, Philadelphia	1.98½	1.98½	1.98½	1.88½
Tank plates, Chicago	1.85	1.85	1.85	1.75
Sheets, No. 10, hot rolled, Pitts.	1.85	1.85	1.85	1.75
Sheets, No. 24, hot ann., Pitts.	2.40	2.40	2.40	2.25
Sheets, No. 24, galvan., Pitts.	3.10	3.10	3.10	2.85
Sheets, No. 10 hot rolled, Gary	1.95	1.95	1.95	1.85
Sheets, No. 24, hot anneal., Gary	2.55	2.55	2.55	2.35
Sheets, No. 24, galvan., Gary	3.20	3.20	3.20	2.95
Plain wire, Pittsburgh	2.30	2.30	2.30	2.20
Tin plate, per base box, Pitts.	5.25	5.25	5.25	5.25
Wire nails, Pittsburgh	2.60	2.60	2.60	2.35

Semifinished Material

Sheet bars, open-hearth, Youngs.	$28.00	$28.00	$28.00	$26.00
Sheet bars, open-hearth, Pitts.	28.00	28.00	28.00	26.00
Billets, open-hearth, Pittsburgh	27.00	27.00	27.00	26.00
Wire rods, Pittsburgh	38.00	38.00	38.00	36.00

Pig Iron

Bessemer, del. Pittsburgh	$19.76	$19.76	$19.76	$19.26
Basic, Valley	18.00	18.00	18.00	17.00
Basic, eastern, del. eastern Pa.	19.76	19.76	19.76	18.76
No. 2 foundry, del. Pittsburgh	19.26	19.26	19.26	18.76
No. 2, foundry, Chicago	18.50	18.50	18.50	17.50
Southern No. 2, Birmingham	14.50	14.50	14.50	13.50
No. 2X eastern, del. Philadelphia	20.63	20.63	20.63	19.63
Malleable, Valley	18.50	18.50	18.50	17.50
Malleable, Chicago	18.50	18.50	18.50	17.50
Lake Superior charcoal, del. Chi.	24.04	24.04	24.04	23.54
Ferromanganese, del. Pittsburgh	89.79	18.63	18.63	18.38
Gray forge, del. Pittsburgh	18.63	89.79	89.79	90.24

Scrap

Heavy melting steel, Pittsburgh	$13.25	$13.50	$11.15	$13.90
Heavy melt. steel, No. 2, east. Pa.	10.25	9.95	8.35	9.75
Heavy melting steel, Chicago	11.75	12.15	9.10	10.90
Rails for rolling, Chicago	12.75	12.90	10.35	11.90
Railroad steel specialties, Chicago	12.25	13.40	10.05	12.50

Coke

Connellsville, furnace, ovens	$3.60	$3.60	$3.60	$3.50
Connellsville, foundry, ovens	4.60	4.60	4.60	4.25
Chicago, by-product foundry, del.	9.25	9.25	9.25	9.25

Steel, Iron, Raw Material, Fuel and Metals Prices

Prices are code levels filed with American Iron and Steel Institute, 350 Fifth avenue, New York. Except when otherwise designated, prices are base, f.o.b. cars. Asterisk denotes price change this week.

Sheet Steel

Hot Rolled No. 10, 24-48 in.

Pittsburgh	1.85c
Gary	1.95c
Chicago, delivered	1.98c
New York, del.	2.18c
Philadelphia, del	2.14c
Birmingham	2.00c
St. Louis, del.	2.17c
Pacific ports, f.o.b. cars, dock	2.40c

Hot Rolled Annealed No. 24

Pittsburgh	2.40c
Gary	2.50c
Chicago, delivered	2.53c
Detroit, delivered	2.60c
New York, del.	2.73c
Philadelphia, del.	2.69c
Birmingham	2.55c
St. Louis, del.	2.72c
Pacific ports, f.o.b. cars, dock	3.05c

Galvanized No. 24

Pittsburgh	3.10c
Gary	3.20c
Chicago, delivered	3.23c
Philadelphia, del.	3.39c
New York, del.	3.43c
Birmingham	3.25c
St. Louis, del.	3.42c
Pacific ports, f.o.b. cars, dock	3.70c

Tin Mill Black No. 28

Pittsburgh	2.75c
Gary	2.85c
St. Louis, delivered	3.07c

Cold Rolled No. 10

Pittsburgh	2.50c
Gary	2.60c
Detroit, delivered	2.70c
Philadelphia, del.	2.79c
New York, del.	2.83c
Pacific ports, f.o.b. cars, dock	3.10c

Cold Rolled No. 20

Pittsburgh	2.95c
Gary	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.24c
New York, del.	3.28c

Enameling Sheets

Pittsburgh, No. 10	2.50c
Pittsburgh, No. 20	3.10c

Tin and Terne Plate

Gary base, 10 cents higher.

Tin plate, coke base con. (box) Pitts.	$5.25
Do., waste-waste	2.75c
Do., strips	2.50c
Long ternes, No. 24 unassorted, Pitts.	3.40c
Do., Gary	3.50c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	23.00	24.00
Plates	26.00	28.00
Sheets	33.00	35.00
Hot strip	20.75	22.75
Cold strip	27.00	29.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	17.00	18.50	21.00	26.00
Plates	20.00	21.50	24.00	29.00
Sheets	25.00	28.00	31.00	35.00
Hot strip	15.75	16.75	21.75	26.75
Cold strip	20.50	22.00	27.00	35.00

Steel Plates

Pittsburgh	1.80c
New York, del.	2.08c
Philadelphia, del.	1.98½c
Boston, delivered	2.20c
Buffalo, delivered	2.03½c
Chicago or Gary	1.85c
Cleveland, del.	1.98½c
Birmingham	1.95c
Coatesville, base	1.90c
Sparrows Pt., base	1.90c
Pacific ports, f.o.b. cars, dock	2.35c
St. Louis, delivered	2.07c

Structural Shapes

Pittsburgh	1.80c
Philadelphia, del.	2.00½c
New York, del.	2.05½c
Boston, delivered	2.18½c
Bethlehem	1.90c
Chicago	1.85c
Cleveland, del.	1.98½c
Buffalo	1.90c
Gulf Ports	2.20c
Birmingham	1.95c
Pacific ports, f.o.b. cars, dock	2.35c

Bars

Soft Steel

Pittsburgh	1.80c
Chicago or Gary	1.85c
Duluth	1.95c
Birmingham	1.95c
Cleveland	1.85c
Buffalo	1.90c
Detroit, delivered	1.95c
Pacific Coast ports cars, dock, c.i.f.	2.35c
Philadelphia, del.	2.09c
Boston, delivered	2.20c
New York, del.	2.13c
Pitts., forg. qual.	1.95c-2.05c

Rail Steel

To Manufacturing Trade

Pittsburgh	1.70c
Chicago or Gary	1.75c
Moline, Ill.	1.75c
Cleveland	1.75c
Buffalo	1.80c

IRON

Terre Haute, Ind.	1.75c
Chicago	1.80c
Philadelphia	1.89c
Pittsburgh, refined	2.75-7.50c

REINFORCING

New billet, straight lengths, quoted by distributors.

Pittsburgh	2.05c
Chicago, Gary, Buffalo Cleve., Birm., Young	2.10c
Gulf ports	2.45c
Pacific coast ports f.o.b. cars dock	2.45c
Philadelphia, del.	2.34c

Rail Steel

Straight lengths quoted by distributors

Pittsburgh	1.90c
Chicago, Buffalo, Cleveland, Birm., Young	1.95c
Gulf ports	2.30c

Wire Products

(Prices apply to straight or mixed carloads; pool cars, or less, 15c up. 10% dis. on nail extras on straight or mixed carloads to one consignee.)

Base, Pitts.-Cleve. 100 lb. keg

Standard wire nails	$2.60
Cement coated nails	2.60
Galvanized nails, 15 gage and coarser	4.60c
do., 16 gage and finer	5.10c

(Per pound)

Polished staples	3.30c
Galvanized fence staples	3.55c
Barbed wire, galv.	3.00c
Annealed fence wire	2.45c
Galvanized fence wire	2.80c
Woven wire fencing (base column, c.l.)	$63.00
Plain wire, 6-9 gage to mfg. trade	2.30c

Anderson, Ind., (merchant products only) and Chicago up $1; Duluth up $2; Birmingham up $3.

Spring wire, Pittsburgh or Cleveland	2.90c

Do., Chicago up $1, Worcester, $2.

Cold-Finished Carbon Bars and Shafting

Base Pitts., one size, shape, grade, shipment at one time to one destination

10,000 to 19,999 lbs.	2.10c
20,000 to 59,999 lbs.	2.05c
60,000 to 99,999 lbs.	2.00c
100,000 lbs and over	1.97½c

Gary, Ind., Cleveland, up 5c; Buffalo, up 10c; Detroit, up 20c; eastern Michigan, up 25c.

Alloy Steel Bars (Hot)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem 2.45c

S.A.E.	Alloy Diff.	S.A.E.	Alloy Diff.
2000	0.25	3100	0.55
2100	0.55	3200	1.35
2300	1.50	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo. 0.50
4600 0.20 to 0.30 Mo. 1.25 1.75 Ni. 1.05
5100 0.80-1.10 Cr 0.45
5100 Cr. spring base
6100 bars 1.20
6100 spring 0.70
Cr., Ni., Van. 1.50
Carbon Van. 0.95
9250....Carbon base plus extras

Piling

Pittsburgh	2.15c
Chicago, Buffalo	2.25c

Strip and Hoops

Hot strip to 23½-in. Pittsburgh	1.85c
Chicago, base	1.95c
Birmingham base,	2.00c
Detroit, delivered	2.05c
Phila., delivered	2.14c
New York, del.	2.18c
Cooperage hoop, Pittsburgh	1.95c
Chicago	2.05c
Cold-rolled strip, Pitts., Cleve.	2.60c
Worcester, Mass.	2.80c

Rails, Track Material

(Gross Tons)

Standard rails, mill	$36.37½
Relay rails, Pitts. 24-45 lbs.	$26.00
50-60 lbs.	$23.00
70-75 lbs.	$20.00
80-85 lbs.	$24.00
100 lbs.	$25.00
Light Rails billet qual. Pitts., Chi.	$35.00
Do., reroll. qual.	$34.00
Angle bars, mills	2.55c
Spikes, R. R. base	2.40c
Track bolts, base	3.55c
Tie plates, base	1.90c

Base, light rails 25 to 40 lbs.; 50 to 60 lbs. inclusive up $5; 16 and 20 lbs., up $1; 12 lbs. up $8; 8 and 10 lbs., up $5. Base railroad spikes 200 kegs or more; base tie plates 20 tons.

Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade for all case lots. Dec. 1, 1932, lists.

CARRIAGE BOLTS

All sizes, cut thread	70-10-10 off
Rolled thread, ⅛ x 6 and smaller	70-10-10 off

MACHINE BOLTS

All sizes, cut thread lag screws, plow bolts, Nos. 1-2-3-7 heads, tap bolts, blank bolts, stud bolts,	70-10-10 off
Tire bolts	60-10 off
Stove bolts, 75 off in pkgs.; 83 off on 15,000 of 3-inch and shorter, or 5000 over 3-inch	
Rolled thread machine bolts, ½ x 6 and smaller	70-10-10 off
Step bolts	70-10 off
Elevator bolts	70-10 off

NUTS

S.A.E. semifinished hex.; ½ to ⅞-inch	70-10-10 off
Do., ½ to 1-inch	70-10-10 off
Do., over 1-inch	70-10 off

HEXAGON CAP SCREWS

Milled	85 off
Upset, 1-in., smaller	85 off

SQUARE HEAD SET SCREWS

Upset, 1-in. small	70-10 off
Headless set screws	75 off

Rivets, Wrought Washers

Struc., c. l., Pittsburgh, Cleveland	2.90c
Struc., c. l., Chicago	3.00c
⅞-in. and smaller, Pitts., Chi., Cleve.	70 and 5 off
Wrought washers, Pitts., Chi., Phila.	6.25 off

Cut Nails

Cut nails, Pitts.; (10% discount on size extras)	$2.75
Do. less carloads, 5 kegs or more no discount on size extras	$3.05
Do. under 5 kegs; no discount on size extras	$3.20

Pipe and Tubing

Base $200 net ton, except on standard commercial seamless boiler tubes under 2 inches and cold drawn seamless tubing.

Welded Iron, Steel Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less. Chicago delivered 2½ points less. Wrought pipe, Pittsburgh base.

BUTT WELD

Steel

In.	Blk.	Gal.
¼ and ⅜	53½	35
½	58½	47
¾	62	52
1—3	64	55

Iron

½	31½	15
¾	36½	20½
1—1¼	39½	25½
2	41½	26

LAP WELD

Steel

2	60	51
2½—3	63	54
3½—6	65	56
7 and 8	64	54
9 and 10	63½	53½

Iron

2	37	22½
2½—3½	38	25
4—8	40	28½

LINE PIPE

Steel

½, butt weld	57½
⅜-inch, butt weld	50½
¼—⅜, butt weld	52½
¾, butt weld	61
1—3, butt weld	63
2-inch, lap weld	59
2½—3, lap weld	62
3½—6, lap weld	64
7—8, lap weld	63

Iron

⅛—1½ inch, black and galv. take 4 pts, over; 2½—6 inch 2 pts. over discounts for same sizes, standard pipe lists, 8—12-inch, no extra.

BOILER TUBES

C. L. Discounts, f.o.b. Pitts.

Lap Weld Steel		Charcoal Iron	
2—2¼	33	1¾	8
2½—2¾	40	2—2¼	13
3	47	2½—2¾	16
3¼—3½	50	3	17
4	52	3¼—3½	18
4½—5	42	4	20
		4½	21

In lots of a carload or more, above discounts subject to preferential of two 5% and one 7½% discount on steel and 10% on charcoal iron.

Lapwelded steel: 200 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 lbs., 2 points under base.

SEAMLESS BOILER TUBES

Under date of May 15 in lots of 40,000 pounds or more for cold-drawn boiler tubes and in lots of 40,000 pounds or feet or more for hot-finished boiler tubes, revised prices are quoted for 55 cold-drawn boiler tube sizes ranging from ¼ to 6-inch outside diameter in 30 wall thicknesses, decimal equivalent from 0.035 to 1.000, on a dollars and cents basis per 100 feet and per pound.

Hot-finished carbon steel boiler tube prices also under date of May 15 range from 1 through 7 inches outside diameter, inclusive, and embrace 47 size classifications in 22 decimal wall thicknesses ranging from 0.109 to 1.000, prices also being on a lb. and 100 ft. basis.

Seamless Tubing

Cold drawn; f.o.b. mill disc.

100 ft. or 150 lbs.	32%
15,000 ft. or 22,500 lbs.	70%

Cast Iron Water Pipe

Class B Pipe—Per Net Ton

6-in. & over, Birm.	$38.00-39.00
4-in., Birmingham	41.00-42.00
4-in., Chicago	49.00-50.00
6 to 24-in., Chicago	46.00-47.00
6-in. & over, east fdy.	42.00
Do., 4-in.	45.00

Class A pipe $3 over Class B.

Stnd. fitgs., Birm. base	$100.00

Semifinished Steel

BILLETS AND BLOOMS

4 x 4-inch base; gross ton

Pitts., Chi., Cleve., and Youngstown	$27.00
Philadelphia	32.30
Duluth	31.00
Forging, Pitts., Chi. and Buffalo	32.00
Forging, Duluth	36.00

SHEET BARS

Pitts., Cleve., Young., Chi., Buff., Canton, Sparrows Pt.	28.00

SLABS

Pitts., Cleve., Young.	27.00

WIRE RODS

(Common; combination up $2)

Pitts., Cleveland	38.00
Chicago	39.00
Worcester, Mass.	40.00

SKELP

Pitts., Chi., Young., Buff., Coatesville, Sparrows Point	1.70c

Coke

Price Per Net Ton

BEEHIVE OVENS

Connellsville, fur.	$3.60- 3.85
Connellsville, fdry.	4.60
Connel. prem. fdry.	5.10
New River fdry.	6.00
Wise county fdry.	4.45- 5.25
Wise county fur.	4.00- 4.50

BY-PRODUCT FOUNDRY

Newark, N. J., del.	9.20- 9.65
Chi., ov., outside del.	8.50
Chicago, del.	9.25
New England, del.	11.00
St. Louis, del.	9.25
Birmingham, ovens	6.00
Indianapolis, del.	8.75
Cincinnati, del.	9.30
Cleveland, del.	9.25
Buffalo, ovens	7.50- 8.00
Detroit ov., out. del.	8.50
Philadelphia, del.	9.00

Coke By-Products

Per gallon, producers' plants.

	Tank lots	Spot
Pure and 90% benzol	15.00c	
Toluol	30.00c	
Solvent naphtha	26.00c	
Commercial xylol	26.00c	

Per lb. f.o.b. New York.

Phenol (200 lb. drums)	16.30c
Do. (100 lbs.)	17.30c

Eastern Plants, per lb.

Naphthalene flakes and balls, in bbls.	5.00c

Per 100 lb. Atlantic seaboard

Sulphate of ammonia	$1.20

†Western prices, ½-cent up.

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25; 50c diff. for each 0.25 below 1.75. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$19.50	$20.00	$19.00	$20.50
Birdsboro, Po.	19.50	20.00	19.00	20.50
Birmingham, Ala., southern del...	14.50	14.50	13.50	19.00
Buffalo	18.50	19.00	17.50	19.50
Chicago	18.50	18.50	18.00	19.00
Cleveland	18.50	18.50	18.00	19.00
Detroit	18.50	18.50	18.00	19.00
Duluth	19.00	19.00	.....	19.50
Erie, Pa.	18.50	19.00	18.00	19.50
Everett, Mass.	19.50	20.00	19.00	20.50
Granite City, Ill.	18.50	18.50	18.00	.....
Hamilton, O.	18.50	18.50	18.00	19.00
Jackson, O.	20.25	20.25	19.75	.....
Neville Island, Pa.	18.50	18.50	18.00	19.00
Provo, Utah	17.50	.....	17.00	.....
Sharpsville, Pa.	18.50	18.50	18.00	19.00
Sparrows Point, Md.	19.50	.....	19.00	.....
Swedeland, Pa.	19.50	20.00	19.00	20.50
Toledo, O.	18.50	18.50	18.00	19.00
Youngstown, O.	18.50	18.50	18.00	19.00
Delivered from Basing Points:				
Akron, O., from Cleveland	19.76	19.76	19.26	20.26
Baltimore from Birmingham	20.02	.....	19.90	.....
Boston from Birmingham	19.62	.....	19.50	.....
Boston from Everett, Mass.	20.00	20.50	19.50	21.00
Boston from Buffalo	20.00	20.50	19.50	21.00
Brooklyn, N. Y., from Bethlehem	21.77	22.27	.....	.....
Brooklyn, N. Y., from Bmgham..	21.30	.....	.....	.....
Canton, O., from Cleveland	19.76	19.76	19.26	20.26
Chicago from Birmingham	†18.72	.....	18.60	.....
Cincinnati from Hamilton, O.	19.51	19.51	19.01	.....
Cincinnati from Birmingham	19.13	.....	19.01	.....
Cleveland from Birmingham	18.62	.....	18.50	.....
Indianapolis from Hamilton, O...	20.77	20.77	20.27	21.27
Mansfield, O., from Toledo, O.	20.26	20.26	19.76	20.76
Milwaukee from Chicago	19.50	19.50	19.00	20.00
Muskegon, Mich., from Chicago, Toledo or Detroit	21.40	21.40	20.90	21.90
Newark, N. J., from Birmingham	20.51	.....	.....	.....
Newark, N. J., from Bethlehem..	20.89	21.39	.....	.....
Philadelphia from Birmingham..	19.88	.....	19.76	.....
Philadelphia from Swedeland, Pa.	20.26	20.76	19.76	.....
Pittsburgh district from Neville Island	Neville base plus 63c, 76c and $1.13 switching charges			
Saginaw, Mich., from Detroit	20.60	20.60	20.10	21.10

Delivered from Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
St. Louis from Granite City, Ill.	19.00	19.00	18.50	.....
St. Louis from Birmingham	18.62	.....	18.50	.....
St. Paul from Duluth	20.94	20.94	.....	21.44

†Over 0.70 phos.

Low Phos

Basing Points: Birdsboro and Steelton, Pa., and Standish, N. Y., $23.50. Phila. base, standard and copper bearing, $24.63.

Gray Forge		Charcoal	
Valley furnace	18.00	Lake Superior fur.	21.00
Pitts. dist. fur.	18.00	Do., del. Chicago	24.04

Silvery†

Jackson County, O., base; 6% $22.75; 7—$23.75; 8—$24.75; 9—$25.70; 10—$26.75; 11—$27.75. Buffalo base prices, up $1.25.

Bessemer Ferrosilicon†

Jackson County, O., base; 10%—$27.75; 11—$28.75; 12—$30.25; 13—$31.75; 14—$33.25; 15—$34.75; 16—$36.25. Buffalo base prices $1.25 higher.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Refractories

Per 1000 f.o.b. Works

Fire Clay Brick

First Quality.

Pa., Ill., Ky., Md., Ga., Mo.	$45.00
Alabama	45.00

Second Quality

Pa., Ill., Ky., Md., Mo., Ga., Ala.	40.00

Ohio

First quality	$40.00-45.00
Intermediary	37.00
Second quality	28.00

Malleable Bung Brick

All bases	50.00

Silica Brick

Pennsylvania	$45.00
Joliet, E. Chicago	54.00
Birmingham, Ala.	52.00

Magnesite

Imported dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	$45.00
Domestic dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	40.00
Domestic dead-burned gr. net ton f.o.b. Chewelah, Wash. (bulk)	22.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Magnesite brick	$65.00
Chrome brick	45.00
Chemically bonded magnesite	55.00

Fluorspar, 85-5

Washed gravel, duty paid, tide, net ton	$19.50
Washed gravel f.o.b. Ill., Ky., net ton, carloads	$15.50-16.00

Ferroalloys

Dollars, except Ferrochrome

Ferromanganese, 78-82% tidewater, duty paid	85.00
Do., Balti. base	85.00
Do., del. Pittsburgh	89.79
Spiegeleisen, 19-20% dom. Palmerton, Pa., spot†	26.00
Do., New Orleans	26.00
Ferrosilicon, 50% freight all., cl.	77.50
Do., less carload	85.00
Do., 75 per cent	126-130.00
Spot, $5 a ton higher.	
Silicomang., 2½ carb.	90.00
2% carbon, 95.00; 1%,	105.00
Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb. con. del.	10.00
Ferrotungsten, stand., lb. cont. del.	1.35- 1.45
Ferrovanadium, 35 to 40% lb., cont., on analysis	2.70- 2.90
Ferrotitanium, c. l., prod. plant, frt. allow., net ton	137.50
Spot, 1 ton, frt. allow., lb.	7.00
do., under 1 ton	7.50
Ferrophosphorus, per ton, c. l., 17-19% Rockdale, Tenn., basis, 18%, $2 unitage	50.00
Ferrophosphorus, electrolytic, per ton c. l., 23-26% f.o.b. Anniston, Ala., 24% $2.75 unitage	65.00
Ferromolybdenum, stand. 55-65%, lb.	0.95
Molybdate, lb. cont.	0.80

†Carloads, Quan. diff. apply.

Nonferrous Prices

METAL PRICES OF THE WEEK

Spot unless otherwise specified. Cents per pound

	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin: New York Spot	Straits Tin: New York Futures	Lead: New York N. Y.	Lead: East St. L.	Zinc: St. L.	Aluminum 99%	Antimony: Chinese Spot, N. Y.	Nickel: Cathodes
Feb. 9	9.00	9.12½	7.50	51.15	50.60	3.50	3.35	3.70	*19.00	14.50	35.00
Feb. 11	9.00	9.12½	7.50	50.75	50.25	3.50	3.35	3.70	*19.00	14.50	35.00
Feb. 12—Holiday											
Feb. 13	9.00	9.12½	7.50	50.37½	49.95	3.55	3.40	3.70	*19.00	14.50	35.00
Feb. 14	9.00	9.12½	7.50	49.85	49.50	3.55	3.40	3.55	*19.00	14.50	35.00
Feb. 15	9.00	9.12½	7.50	49.95	49.80	3.55	3.40	3.55	*19.00	14.50	35.00

*Nominal range 19.00 to 21.00c.

MILL PRODUCTS

F.o.b. mill base, cents per lb. except as specified. Copper, brass products based on 9.00c Conn. copper.

Sheets	
Yellow brass (high)	14.25
Copper, hot rolled	16.00
Lead, cut, to jobbers	7.25
Zinc, 100-lb. base	9.50
Tubes and Pipes	
High yellow brass	16.00
Seamless copper	16.25
Rods	
High yellow brass	12.75
Copper, hot rolled	18.25
Anodes	
Copper, untrimmed	13.75
Wire	
Yellow brass (high)	14.75

OLD METALS

Deal. buying prices, cents lb.

No. 1 Composition Red Brass	
New York	4.25- 4.50
Chicago	4.37½-4.62½
*Cleveland	5.00- 5.25
St. Louis	4.75- 5.00
Heavy Copper and Wire	
New York	5.75- 6.00
Chicago, No. 1	5.50- 5.75
Cleveland	5.50- 5.75
*St. Louis	5.25- 5.50
Composition Brass Borings	
New York	3.75- 4.00
Light Copper	
New York	4.50- 4.75
Chicago	4.25- 4.50
Cleveland	4.75- 5.00
St. Louis	4.75- 5.00
Light Brass	
Chicago	2.25- 2.50
*Cleveland	2.25- 2.50
Lead	
*New York	2.70- 2.80
Cleveland	2.35- 2.60
Chicago	2.50- 2.75
*St. Louis	2.65- 2.75
Zinc	
New York	1.75- 2.00
Cleveland	1.75- 2.00
St. Louis	2.25- 2.40
Aluminum	
*Borings, Cleveland	7.00- 7.50
*Mixed, cast, Clev.	11.50-12.00
*Mixed, cast, St. L.	12.75-13.00
*Clips, soft, Clev.	13.50-13.75

SECONDARY METALS

Brass ingot, 85-5-5-5	8.25
Stand. No. 12 Alum.	16.00-17.00

Iron and Steel Scrap Prices

Corrected to Friday night Gross tons delivered to consumers, except where otherwise stated

HEAVY MELTING STEEL

Birmingham	9.00- 9.50
Boston, dock, expt.	9.00- 9.25
Boston, domestic	7.25- 7.50
Buffalo, No. 1	12.50-13.00
Buffalo, No. 2	11.00-11.50
Chicago, No. 1	11.50-11.75
Cleveland, No. 1	11.00-11 50
Cleveland, No. 2	10.50-11.00
Detroit, No. 1	9.50-10.00
Detroit, No. 2	8.50- 9.00
Eastern Pa., No. 1	11.50-12.00
Eastern Pa., No. 2	10.00-10.50
Federal, Ill.	8.25- 8.75
Granite City, R. R.	9.50-10.00
Granite City, No. 2	7.50- 8.00
N. Y., deal. No. 2	7.50- 7.75
N. Y., deal. barge	9.00- 9.25
Pittsburgh, No. 1	13.00-13.50
St. Louis	8.00- 8.50
Valleys, No. 1	13.25-13.75

COMPRESSED SHEETS □

Buffalo, dealers	11.00-11.50
Chicago, factory	10.25-10.75
Chicago, dealer	9.75-10.25
Cleveland	11.00-11.50
Detroit	9.50-10.00
E. Pa., new mat.	10.00-10.50
Pittsburgh	13.00-13.50
St. Louis	7.00- 7.50
Valleys	12.75-13.00

BUNDLED SHEETS □ □

Buffalo	8.50- 9.00
Cincinnati, del.	6.50- 7.00
Cleveland	8.50- 9.00
Pittsburgh	11.50-12.00
St. Louis	5.00- 5.50

SHEET CLIPPINGS, LOOSE □

Chicago	6.00- 6.50
Cincinnati	6.00- 6.50
Detroit	5.00- 5.50
St. Louis	5.00- 5.50

STEEL RAILS, SHORT □

Birmingham	12.00-12.50
Buffalo	13.25-13.75
Chicago (3 ft.)	13.00-13.50
Chicago (2 ft.)	14.00-14.50
Cincinnati, del.	12.00-12.50
Detroit	12.00-12.50
Pitts., open-hearth, 3 ft. and less	14.50-15.00
St. Louis, 2 ft. & less	12.50-13.00

STEEL RAILS, SCRAP □

Boston	7.00- 7.25
Chicago	11.50-11.75
Pittsburgh	13.50-14.00

STOVE PLATE □ □

Birmingham	6.00- 6.50
Boston, dealers	4.00- 4.25
Buffalo	9.25- 9.75
Chicago, net	6.50- 7.00
Cincinnati, dealers	6.00- 6.50
Detroit, net	6.00- 6.50
Eastern Pa.	8.50- 9.00
N. Y., deal. fdry.	6.00
St. Louis	5.50- 6.00

COUPLERS, SPRINGS

Buffalo	13.25-13.75
Chicago, springs	12.50-13.00
Eastern Pa.	14.50-15.00
Pittsburgh	14.50-15.00
St. Louis	10.50-11.00

ANGLE BARS—STEEL □

Chicago	12.25-12.75
St. Louis	11.00-11.50

RAILROAD SPECIALTIES

Chicago	12.00-12.50

LOW PHOSPHORUS

Buffalo, billets and bloom crops	13.25-13.75
Cleveland, billet, bloom crops	15.00-15.50
Eastern Pa., crops	15.00-15.50
Pittsburgh, billet, bloom crops	15.00-15.50
Pittsburgh, sheet bar crops	14.00-14.50

FROGS, SWITCHES □ □

Chicago	11.50-12.00
St. Louis, cut	10.50-11.00

SHOVELING STEEL □ □

Chicago	11.50-11.75
Federal, Ill.	8.25- 8.75
Granite City, Ill.	7.50- 8.00

RAILROAD WROUGHT □

Birmingham	7.50- 8.00
Boston, dealers	6.00- 6.50
Buffalo, No. 1	10.50-11.00
Buffalo, No. 2	12.50-13.00
Chicago, No. 1, net	10.50-11.00
Chicago, No. 2	11.50-11.75
Cincinnati, No. 2	8.50- 9.00
Eastern Pa.	11.50-12.00
N. Y., No. 1, deal.	7.00- 7.50
St. Louis, No. 1	7.00- 7.50
St. Louis, No. 2	9.75-10.25

SPECIFICATION PIPE □

Boston	3.00- 3.25
Eastern Pa.	9.50-10.00
New York, dealers	3.50- 4.00

BUSHELING □ □

Buffalo, No. 1	11.00-11.50
Chicago, No. 1	10.25-10.75
Cinci., No. 1, deal.	6.50- 7.00
Cincinnat, No. 2	3.00- 3.50
Cleveland, No. 2	8.00- 8.50
Detroit, No. 1, new	8.50- 9.00
Valleys, new, No. 1	12.50-13.00

MACHINE TURNINGS □

Birmingham	4.50- 5.00
Boston, dealers	3.00- 3.25
Buffalo	6.00- 6.50
Chicago	6.50- 7.00
Cincinnati, dealers	4.00- 4.50
Cleveland	7.50- 8.00
Detroit	4.50- 5.00
Eastern Pa.	6.50- 7.00
New York, dealers	3.50- 3.75
Pittsburgh	9.00- 9.50
St. Louis	3.50- 4.00
Valleys	9.00- 9.50

BORINGS AND TURNINGS □

For Blast Furnace Use

Boston, dealers	3.25- 3.50
Buffalo	6.50- 7.00
Cincinnati, dealers	5.00- 5.50
Cleveland	8.00- 8.50
Detroit	5.50- 6.00
Eastern Pa.	5.00
New York, dealers	1.50- 1.75
Pittsburgh	7.00- 8.00

CAST IRON BORINGS

Birmingham, plain	4.50- 5.00
Boston, chemical	8.50- 9.00
Boston, dealers	3.25- 3.50
Buffalo	6.50- 7.00
Chicago	6.50- 7.00
Cincinnati, dealers	4.00- 4.50
Cleveland	8.00- 8.50
Detroit	5.50- 6.00
E. Pa., chemical	12.00-13.00
New York, dealers	1.50- 1.75
Pittsburgh	7.00- 8.00
St. Louis	3.00- 3.50

PIPE AND FLUES □ □

Cincinnati, dealers	5.00- 5.50

RAILROAD GRATE BARS □

Buffalo	7.00- 7.50
Chicago, net	6.00- 6.50
Cincinnati	4.50- 5.00
Eastern Pa.	9.00
New York, dealers	4.00- 4.50
St. Louis	4.50- 5.00

FORGE FLASHINGS □ □

Boston, dealers	6.00- 6.25
Buffalo	10.50-11.00
Cleveland	9.50-10.00
Detroit	8.00- 8.50

FORGE SCRAP □ □

Boston, dealers	5.00- 5.25
Chicago, heavy	12.50-13.00
Eastern Pa.	9.50-10.00

ARCH BARS, TRANSOMS

St. Louis	12.25-12.75

AXLE TURNINGS □ □

Boston, dealers	3.00- 3.50
Buffalo	7.50- 8.00
Chicago, elec. fur.	11.00-11.50
Cleveland	8.00- 8.50
Eastern Pa.	9.50-10.00
St. Louis	6.50- 7.00

STEEL CAR AXLES □ □

Birmingham	12.50-13.00
Boston, ship. point.	10.00-10.50
Buffalo	13.25-13.75
Chicago, net	15.75-16.25
Eastern Pa.	16.50-17.00
St. Louis	14.00-14.50

SHAFTING □ □

Boston, ship. point.	12.25-12.50
Eastern Pa.	17.50
New York, dealers	11.50-12.00
St. Louis	11.50-12.00

CAR WHEELS □ □

Birmingham	9.00- 9.50
Boston, iron deal.	6.00- 6.50
Buffalo, iron	11.00-11.50
Buffalo, steel	13.25-13.75
Chicago, iron	12.00-12.50
Chicago, rolled steel	12.00-12.50
Cincinnati, iron	8.50- 9.00
Eastern Pa., iron	10.50-11.00
Eastern Pa., steel	14.50-15.00
Pittsburgh, iron	12.50-13.00
Pittsburgh, steel	14.50-15.00
St. Louis, iron	8.75- 9.25
St. Louis, steel	10.50-11.00

No. 1 CAST SCRAP □ □

Birmingham	9.50-10.00
Boston, No. 1 mach.	8.50- 9.00
Boston, No. 2	7.50
Boston, tex. con.	8.50- 9.00
Buffalo, cupola	10.50-11.00
Buffalo, mach.	12.00-12.50
Chicago, agri. net	9.00- 9.50
Chicago, auto	10.50-11.00
Chicago, mach. net	10.50-11.00
Chicago, railr'd net	9.50-10.00
Cinci., mach. cup	9.00- 9.50
Cleveland, cupola	12.50-13.00
Detroit, net	9.50-10.00
Eastern Pa., cupola	11.50-12.50
Pittsburgh, cupola	13.00-13.50
San Francisco, del.	13.50-14.00
Seattle	7.00- 8.50
St. Louis, No. 1	9.00- 9.50
St. L., No. 1 mach.	10.25-10.75

HEAVY CAST □ □

Boston, del.	6.00- 6.25
Buffalo, break.	9.00- 9.50
Cleveland, break.	9.50-10.00
Detroit, auto net	10.50
Detroit, auto net	9.50-10.00
Eastern Pa.	11.00
N. Y. break. deal.	6.50- 6.75
Pittsburgh	12.00-12.50

MALLEABLE □ □

Boston, consum.	10.00-10.50
Buffalo	12.75-13.25
Chicago, R. R.	13.00-13.50
Cincinnati, agri. del.	8.75- 9.25
Cleveland, rail	13.00-13.50
Detroit, auto	11.00-11.50
St. Louis, R. R.	10.00-10.50
Eastern Pa., R. R.	11.00-11.50

RAILS FOR ROLLING □

5 feet and over

Birmingham	11.00-11.50
Boston, dealers	8.00- 8.50
Buffalo	12.50-13.00
Chicago	12.50-13.00
Eastern Pa.	12.50-13.00
New York, dealer	7.50- 8.00
St. Louis	10.75-11.25

LOCOMOTIVE TIRES □

Chicago (cut)	12.50-13.00
St. Louis, No. 1	10.00-10.50

LOW PHOS. PUNCHINGS □

Buffalo	13.25-13.75
Chicago	13.50-14.00
Eastern Pa.	14.50-15.00
Pittsburgh	14.50-15.00

Iron Ore

Lake Superior Ore

Gross ton, 51½% Lower Lake Ports

Old range bessemer	$4.80
Mesabi nonbess.	4.50
High phosphorus	4.40
Mesabi bessemer	4.65
Old range nonbes.	4.65

Eastern Local Ores

Cents, unit, del. E. Pa.

Foundry and basic 56-63% con. (nom.)	8.00- 9.00
Cop.-free low phos. 58-60% (nom.)	10.00-10.50

Foreign Ore

Cents per unit, f.a.s. Atlantic ports (nominal)

Foreign manganiferous ore, 45.55% iron, 6-10% man.,	10.00
No. Afr. & low phos.	9.50
Swedish basic, 65%	9.00
Swedish low phos.	9.50
Spanish No. Africa basic, 50 to 60%	9.00
Tungsten, spot, sh. ton unit, duty pd.	$17.75-18.25
N. F. fdy., 55%	7.00
Chrome ore, 48% gross ton, c.i.f.	$18.00-18.50

Manganese Ore

(Nominal)

Prices not including duty, cents per unit cargo lots.

Caucasian, 52-55%	26.00
So. African, 52%	26.00
So. Afr., 49-51%	24.00
Indian, 58-50%	nominal
Indian, 48-50%	nominal

Warehouse Iron and Steel Prices

Cents per pound for delivery within metropolitan districts of cities specified

STEEL BARS	
Baltimore*.....	2.90c
Boston††	2.95c
Buffalo	3.00c
Chattanooga..	3.31c
Chicago	2.95c
Cincinnati	3.15c
Cleveland	2.95c
Detroit	3.03½c
Houston	3.00c
Los Angeles..	3.70c
Milwaukee	3.06c
New Orleans..	3.30c
New York‡(d)	3.22c
Pittsburgh(h)	2.90c
Philadelphia*	2.90c
San Francisco	3.60c
Seattle	3.60c
St. Louis.....	3.19c
St. Paul.....	3.00c
Tulsa	3.25c
IRON BARS	
Portland	3.40c
Chattanooga..	3.31c
Baltimore*.....	3.00c
Chicago	2.75c
Cincinnati	3.15c
New York‡(d)	3.32c
Philadelphia*	2.90c
St. Louis	3.19c
Tulsa	3.25c
REINFORCING BARS	
Buffalo	2.60c
Chattanooga..	3.31c
Chicago 2.10c-2.60c	
Cleveland (c)	2.10c
Cincinnati	3.25c
Houston	3.25c
Los Ang., cl...	2.15c
New Orleans	3.50c
Pitts., plain(h)	2.05c
Pitts., twisted squares (h)	2.175c
San Francisco	2.45c
Seattle	3.50c
St. Louis.....	3.24c
Tulsa	3.25c
Young. 2.30c-2.60c	
SHAPES	
Baltimore*....	2.95c
Boston††	3.17c
Buffalo	3.25c
Chattanooga..	3.56c
Chicago	3.20c
Cincinnati	3.40c
Cleveland	3.31c
Detroit	3.40c
Houston	3.00c
Los Angeles..	3.70c
Milwaukee	3.31c
New Orleans	3.55c
New York(d)	3.37c
Philadelphia*	2.95c
Pittsburgh(h)	3.15c
Portland	3.55c
San Francisco	3.55c
Seattle	3.55c
St. Louis.....	3.44c
St. Paul.....	3.25c
Tulsa	3.50c
PLATES	
Baltimore*....	2.95c
Boston††	3.18c
Buffalo	3.37c
Chattanooga..	3.56c
Chicago	3.20c
Cincinnati	3.40c
Cleveland, ¼-in. and over	3.31c
Detroit	3.40c
Detroit, ⅜-in.	3.65c
Houston	3.00c
Los Angeles..	3.70c
Milwaukee	3.31c
New Orleans	3.55c
New York(d)	3.40c
Philadelphia*	2.95c
Phila. floor....	4.95c
Pittsburgh(h)	3.15c
Portland	3.55c
San Francisco	3.55c
Seattle	3.55c
St. Louis.....	3.44c
St. Paul.....	3.25c
Tulsa	3.50c
NO. 10 BLUE	
Baltimore*.....	3.05c
Boston††	3.25c
Buffalo	3.62c
Chattanooga..	3.36c
Chicago	3.05c
Cincinnati	3.20c
Cleveland	3.11c
Det., 8-10 ga.	3.13½c
Houston	3.35c
Los Angeles..	3.80c
Milwaukee	3.16c
New Orleans	3.55c
New York.....	3.27c
Portland	3.75c
Philadelphia*	3.05c
Pittsburgh(h)	2.95c
San Francisco	3.75c
Seattle	3.75c
St. Louis.....	3.29c
St. Paul.....	3.45c
Tulsa	3.70c
NO. 24 BLACK	
Baltimore*†...	3.51c
Boston (g)	3.90c
Buffalo	3.25c
Chattanooga..	4.21c
Chicago	3.85c
Cincinnati	4.05c
Cleveland	3.91c
Detroit	3.98½c
Los Angeles..	4.45c
Milwaukee	3.96c
New York.....	3.85c
Philadelphia*†	3.55c
Pitts.** (h)....	3.55c
Portland	4.40c
San Francisco	4.40c
Seattle	4.40c
St. Louis.....	4.09c
St. Paul	3.695c
Tulsa	4.75c
NO. 24 GALV. SHEETS	
Baltimore*†...	4.21c
Buffalo	4.00c
Boston (g)....	4.60c
Chattanooga..	4.86c
Chicago (h)..	4.55c
Cincinnati	4.70c
Cleveland	4.61c
Detroit	4.70c
Houston	4.40c
Los Angeles..	5.05c
Milwaukee	4.66c
New Orleans	4.95c
New York.....	4.50c
Philadelphia*†	4.25c
Pitts.** (h)....4.15-4.45c	
Portland	5.00c
San Francisco	5.00c
Seattle	5.00c
St. Louis.....	4.79c
St. Paul.....	4.19c
Tulsa	5.10c
BANDS	
Baltimore*	3.15c
Boston††	3.25c
Buffalo	3.42c
Chattanooga..	3.61c
Chicago	3.30c
Cincinnati	3.45c
Cleveland	3.36c
Detroit, ⅞-in. and lighter	3.38½c
Houston	3.25c
Los Angeles..	3.90c
Milwaukee	3.41c
New Orleans	3.95c
New York(d)	3.62c
Philadelphia..	3.15c
Pittsburgh(h)	3.20c
Portland	3.90c
San Francisco	4.05c
Seattle	3.90c
St. Louis.....	3.54c
St. Paul.....	3.20c
Tulsa	3.45c
HOOPS	
Baltimore	2.30c
Boston	4.25c
Buffalo	3.42c
Chicago	3.30c
Cincinnati	3.45c
Det., No. 14 and lighter	3.38½c
Milwaukee	3.41c
New York.....	3.62c
Philadelphia..	3.40c
Pittsburgh(h)	3.70c
Seattle	5.60c
St. Louis.....	3.54c
St. Paul.....	3.75c
COLD. FIN. STEEL	
Baltimore (c)	3.71c
Boston 3.85c-4.00c	
Buffalo (h)....	3.55c
Chattanooga*	4.06c
Chicago (h)..	3.50c
Cincinnati	3.70c
Cleveland (h)	3.50c
Detroit	3.63½c
Los Ang.(f)(d)	4.95c
Milwaukee	3.61c
New Orleans	4.30c
New York....3.92c-4.42c	
Philadelphia..	3.73c
Pittsburgh(h)	3.45c
Portland (f).....	4.75c
San Fran.(f)(d)	5.95c
Seattle(f) (d)	4.75c
St. Louis.....	3.74c
St. Paul.....	3.20c
Tulsa	4.65c
COLD ROLLED STRIP	
Boston, 0.100-in., 500 lb. lots	5.35c
Buffalo	3.39c
Chicago	3.27c
Cincinnati(b)	3.42c
Cleveland (b)	3.20c
Detroit	3.33c
New York.....	4.70c
St. Louis.....	3.36c

TOOL STEELS

(Applying on or east of Mississippi river; west of Mississippi 1c up)

	Base
High speed	57c
High carbon, high chrome	37c
Oil hardening	22c
Special tool	20c
Extra tool	17c
Regular tool	14c

Uniform extras apply

Current Iron and Steel Prices of Europe

Dollars at Rates of Exchange, Feb. 14

Export Prices f. o. b. Ship at Port of Dispatch—By Cable (or Radio)

	British gross tons U. K. ports £ s d	Continental Channel or North Sea ports, metric tons Quoted in dollars at current value	**Quoted in gold pounds sterling £ s d
PIG IRON			
Foundry, 2.50-3.00 Silicon..	$15.01 3 1 6	$13.78	1 14 0
Basic bessemer.....	13.42 2 15 0*	12.97	1 12 0
Hematite, Phos. .03-.05....	15.25 3 2 6	.....	.....
SEMIFINISHED STEEL			
Billets.....	$26.84 5 10 0	$19.04	2 7 0
Wire rods, No. 5 gage.....	38.06 7 16 0	36.49	4 10 0
FINISHED STEEL			
Standard rails.....	$37.82 7 15 0	$44.60	5 10 0
Merchant bars.....	1.63c 7 10 0	1.15c to 1.20c	3 2 6 to 3 5 0
Structural shapes.....	1.60c 7 7 6	1.13c	3 1 6
Plates, †¼ in. or 5 mm.....	1.74c 8 0 0	1.51c	4 2 6
Sheets, black, 24 gage or 0.5 mm.....	2.01c 9 5 0	2.13c	5 16 0††
Sheets, gal., 24 gage, corr...	2.44c 11 5 0	2.38c	6 10 0
Bands and strips.....	1.84c 8 10 0	1.46c	4 0 0
Plain wire, base.....	2.01c 9 5 0	1.96c	5 7 6
Galvanized wire, base.....	2.44c 11 5 0	2.30c to 2.33c	6 5 6 to 6 7 6
Wire nails, base.....	2.60c 12 0 0	2.11c	5 15 0
Tin plate, box 108 lbs.....	$ 4.39 0 18 2	.....	.....

British ferromanganese $85 delivered Atlantic seaboard, duty-paid. German ferromanganese £9 0s 0d $(43.74) f.o.b.

Domestic Prices at Works or Furnace—Last Reported

	L s d		French Francs		Belgian Francs		Reich Marks
Fdy. pig iron, Si. 2.5.....	$16.47	3 7 6(a)	$17.16	260	$14.48	310	$24.89 62
Basic bessemer pig iron....	16.47	3 7 6(a)*	12.21	185	13.31	285	27.90 (b) 69.50
Furnace coke.....	4.27	0 17 6	7.92	120	5.14	110	7.63 19
Billets.....	26.84	5 10 0	28.38	430	20.55	440	38.74 96.50
Standard rails.....	1.79c	8 5 0	2.08c	694	2.31c	1,100	2.40c 132
Merchant bars.....	1.87c	8 12 0	1.68c	560	1.16c	550	2.00c 110
Structural shapes.....	1.90c	8 15 0	1.65c	550	1.16c	550	1.96c 107.50
Plates, †¼-in. or 5 mm.....	1.97c	9 1 3	2.10c	700	1.47c	700	2.31c 127
Sheets, black.....	2.28c	10 10 0§	2.55c	850‡	1.63c	775‡	2.62c 144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.....	2.82c	13 0 0	4.05c	1,350	3.15c	1,500	6.73c 370
Plain wire.....	2.01c	9 5 0	3.15c	1,050	2.31c	1,100	3.15c 173
Bands and strips.....	2.03c	9 7 0	1.95c	650	1.47c	700	2.31c 127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic pric British quotations are for basic open-hearth steel. Continental usually for basic-bessemer steel a del. Middlesbrough. b hematite †† Close annealed

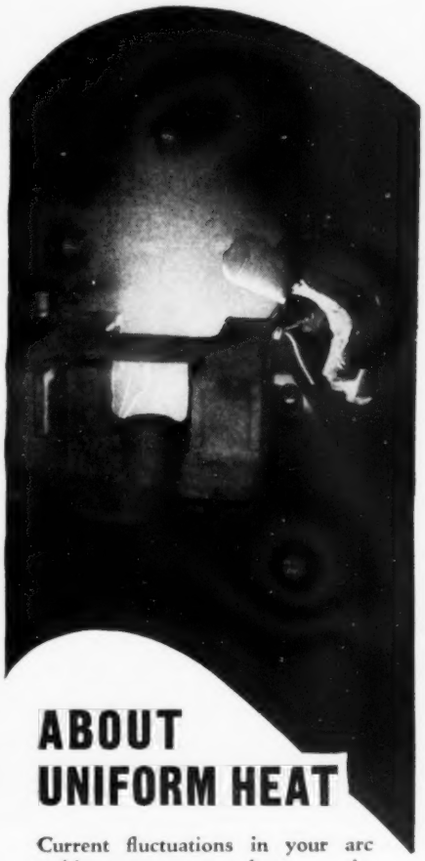
**Gold pound sterling carries a premium of 66.47 per cent over paper sterling.

(b) Plus straightening, cutting and quantity differentials; (c) Plus mill, size and quantity extras; (d) Minus quant. diff.; (e) New mill classif.; (f) Rounds only; (g) 50 bundles or over; (h) Outside delivery, 10c less.

‡Domestic bars; *Plus quan. extras; **Under 25 bundles; *†50 or more bundles; †New extras apply; ††Base 40,000 lbs. extras on less.

Prices on heavier lines are subject to new quantity differentials; 399 lbs. and less, up 50 cts.; 400 to 9999 lbs., base; 10,000 to 19,999 lbs., 15 cts. under; 20,000 to 39,999 lbs., 25 cts. under; 40,000 lbs. and over, 35 cts. under base.

WHAT EVERY WELDING OPERATOR SHOULD KNOW...



ABOUT UNIFORM HEAT

Current fluctuations in your arc welder mean uneven heat . . . irregular penetration . . . variations in metal fusion . . . lack of uniform strength. That's when the oscillograph record
looks like this:
It's uniform heat that determines the strength and quality of your welds. When the oscillograph record looks
like this:
the welds will be of uniform penetration and density. And they'll be uniform from one weld to another.

That's why P&H-Hansen puts so much emphasis on uniform heat delivery at the arc . . . why the stable arc characteristic is "built in" — not artificially produced by separate stabilizers. Study the P&H-Hansen features. Ask for the 24-page Bulletin "Weld It Well".

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4411 W. National Ave., Milwaukee, Wis.

P&H HANSEN ARC WELDERS

—The Market Week—

Bars

Bar Prices, Page 66

Pittsburgh—Merchant bar producers continue to roll against a fair backlog, but the latter is declining. A slightly over-bought condition seems to characterize automobile bar buying both in carbon and alloy grades. Determination of second-quarter bar prices is scheduled for consideration this week and there are few market factors at the present time forecasting any price increase.

Cleveland—The moderate decline in steelworks operations has created no uneasiness here. Leading interests reported new tonnage holding up, and again pointed out the diversity of orders, especially those from agricultural implement manufacturers. Shipments on prior orders from automobile forge shops continue unabated. Sellers now expect demand will continue on a fairly substantial level for some weeks, rather than decline. It is definite that prices will be reaffirmed for second quarter.

Considerable inquiry is being received for oil-country material.

Chicago—While steel bar demand is fairly well maintained and producers are assured of comfortable operations for first quarter, there is no additional betterment in orders generally. Automotive buying is lighter though shipments are well maintained, while requirements of farm implement manufacturers are at a steady rate. Various miscellaneous consumers of bars show occasional increase in needs.

Boston—Forging steel bars are in fair demand, comparatively better than commercial steel and alloy bars, although the latter are unchanged with a steady flow of small orders. Closing Feb. 26, the navy department is taking bids on flat and round bars for destroyers being built at the Boston navy yard.

New York—Movement of commercial steel bars continues to fall short of trade expectations, although volume so far this quarter exceeds that of the corresponding period last quarter. Reaffirmation of prices for second quarter is expected, with the market 1.80c, Pittsburgh, or 2.13c, New York.

Philadelphia — Cold rollers continue to take a substantial tonnage of commercial steel bars, due principally to demands from machinery equipment companies. Fair tonnage is also going to bolt and nut manufacturers but jobbers and railroads, are still specifying lightly. A moderately good tonnage of special analysis steel is being consumed by heavy spring manufacturers. Com-

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P&H CONVERTIBLE MOTORS

mercial steel bars are 1.80c, Pittsburgh, or 2.09c, Philadelphia, with the market expected to be reaffirmed for second quarter. Steadiness also is noted in common iron bar prices, which are 1.70c, Pittsburgh, or 1.99c, Philadelphia.

Navy department, Washington, opens bids Feb. 26 on a substantial tonnage of bars for the local navy yard; also for Brooklyn and Norfolk, Va.

Plates

Plate Prices, Page 66

Pittsburgh—According to plans, Commonwealth Edison Co., Chicago, is about to let a five-year contract soon for hauling coal from Havana, Ill., to Chicago. The Ohio River Co., Cincinnati, American Barge Line and Union Barge Line, both of Pittsburgh, are figuring on this hauling contract. Successful bidder would require floating equipment, estimated by some to involve at least two towboats and about 25 barges, requiring upwards 5000 tons of plates. A total of 1150 tons of ¾-inch plates will be needed by Treadwell Construction Co., Midland, Pa., for 640 12-foot 6-inch flanged fabricated pipe sections of 28-inch i.d. if Kansas City engineers award the company the contract on the basis of its $89,331.67 low bid announced last week. Pressed Steel Car Co., Pittsburgh, will require about 2000 tons of plates and shapes to build 300 wood and steel automobile box cars for the Cincinnati, New Orleans & Texas Pacific. Some plate interests are figuring an inquiry from Rio de Janeiro, Brazil, for 12,500 tons of fabricated plates into 48-inch diameter pipe.

Cleveland—Small, miscellaneous orders are fairly plentiful, and tonnage booked so far this month is slightly above that in the comparable period in January. Cleveland plate mills are operating at 35 per cent. Railroads are ordering more material for repairs. Prices will be filed Feb. 18, unchanged from present levels.

Some sellers anticipate a final decision from the interstate commerce commission in March on the railroads' petition for an increase of 10 per cent on iron and steel freight rates. Under the code, prices are quoted on a delivered basis, with the freight rate in effect at time of shipment. Consumers would pay the increase, which might lead to purchasing for stock. Producers would be penalized only in having to absorb the difference between present and higher rates to meet prices to consumers nearer basing points.

Chicago—Plate demand is improving. Orders are small but numerous, from a diversified group of consumers. Lack of heavy tonnage from railroads and equipment builders still restricts total tonnage, though orders from the carriers have been slightly heavier recently. Reports on probable expenditures by the petroleum industry this year for equipment construction and repair work indicate that larger tonnages of plates will be required than for several years.

Boston—Of the heavier hot-rolled products, plates show a better, but still limited, increase. Small shipments prevail, but such orders are more numerous. Repairs at shipyards and better buying by one New England railroad are notable. Industrial demand, including heads for small tanks and containers has improved.

New York—Demand for steel plates shows no further improvement although a substantial tonnage is being consumed in car repairs. Postponement of mill quantity extras on plates and shapes for another three months has been announced. Base prices are likely to be reaffirmed this week for second quarter. Oil and general tank business is light.

Philadelphia—Plate specifications are lighter. While some of the best freight car business in several months has been placed recently, none has gone to builders in this district, and in general railroad requirements continue light, pending inauguration of further modest equipment repair programs now under discussion. Tank work is negligible at the moment and the recent good volume of specifications for ship repairs appears to have subsided. No change in the plate price of 1.90c, Coatesville, Pa., or 1.98½c, Philadelphia, is expected, when producers start filing their prices this week for second quarter.

Washington—Bureau of ordnance, navy department, has awarded 1440 tons of armor plate, under schedule No. 164-ORD, approximately 905 tons going to Carnegie Steel Co., Pittsburgh, 280 tons to Midvale Co., Nicetown, Pa., and 265 tons to Bethlehem Steel Co., Bethlehem, Pa.

Seattle—Tacoma shortly will announce award of a pipeline extension involving about 4000 tons of plates, for which Puget Sound Machinery Depot, Seattle, is low. United States engineer, Portland, Oreg., expects to call bids before June 30 for construction of a 117-foot steel hull, for the coast and geodetic survey. Bids for the diesel generators will be opened March 8. Cost of the vessel will be $200,000.

Contracts Placed

205 tons, 14 pressure tanks, Gulf Refining Co., Port Arthur, Tex., to Petroleum Iron Works Co. of Texas, Beaumont, Tex.; previously reported as awarded to Petroleum Iron Works Co., Sharon, Pa.

150 tons, tanks, Shelbyville, Ky., to Chicago Bridge & Iron Works, Chicago.

Contracts Pending

12,500 tons, 48-inch pipe, for Rio de Janeiro, Brazil.

2000 tons, plates and shapes, for Pressed Steel Car Co., Pittsburgh, to construct 300 automobile box cars for Cincinnati, New Orleans & Texas Pacific.

1150 tons, 640 28-inch i. d. flanged pipe in ¾-inch plate sections, each 12 feet, 6 inches long, for Fort Peck, Montana, dam dredges; Treadwell Construction Co., Midland, Pa., low at $89,331.67, delivered; McClintic-Marshall Corp., Bethlehem, Pa., second low at $92,531.67; Taylor Forge & Pipe Works, Chicago, $94,795.83, and Babcock & Wilcox Co., Denver, $100,147.87.

Unstated, 117-foot diesel-driven steel survey vessel for coast and geodetic survey; bids to United States engineer, Portland, Oreg., soon.

Unstated tonnage, 500,000-cubic foot gas holder, Northern States Power Co., La Crosse, Wis.; bids in.

Sheets

Sheet Prices, Page 66

Pittsburgh — Continuation of a strong 70 per cent rate of operations in the sheet industry is practically assured for the remainder of the quarter. Many buyers, especially of cold-rolled sheets, are asking for preferred positions on early April sheet mill rolling schedules. There is little probability of a general price advance in sheets for the second quarter. So insistent upon deliveries have some buyers been that it is reported $5 a ton premiums, in the form of re-established drawing extras, have been paid in some cases in the past few weeks.

Cleveland—Actual production and consumption of sheets has been little affected by the general moderation in market activity. Sheet mills here and an adjacent lake district continue operating close to capacity, and shipments are going forward regularly, by train and truck. Considerable tonnage still is being offered to mills by automobile manufacturers for delivery in this quarter, and some orders have been sent in for second quarter for entry when books are opened March 1. In miscellaneous business, refrigerator requirements are the most active. Present prices will be filed Feb. 18 to apply to second quarter.

Chicago—Output of some sheet mills for the balance of the quarter has been contracted for and little additional business is being booked. Due to the code, orders for delivery beyond March cannot be accepted, though some buyers are sounding out possibilities of obtaining requirements during the coming quarter. While most sheet tonnages

shipped this year have been for actual requirements, some of the larger users are believed to have protected themselves against delays in deliveries during March by accumulating stocks at this time. While second quarter prices have yet to be announced, no changes in base quotations are looked for.

Boston—Sheet buying is steady, with increases for some finishes, notably blue annealed for small tank fabrication. Builders of such tanks are in several instances stocking finished tanks against next season's oil burner requirements.

New York—Sheet demand here is being at least sustained, although lacking some of the bouyancy of a fortnight or so ago. Deliveries on hot rolled products are being gradually extended and on some of the lighter gages of black sheets, where reasonably good widths are involved, some sellers are out of the market for the quarter. The trade looks for prices to be reaffirmed for second quarter.

Approximately 300 tons of sheets will be required for an addition to the Library of Congress building, Washington.

Philadelphia—Miscellaneous sheet buying has eased off. Autobody builders have ordered practically all that mills can supply them this quarter and are showing keen interest in tonnage for second quarter.

It is believed there will be no change in sheet prices for second quarter, when producers start posting their quotations with the code authority this week.

Buffalo—Sheet mills here have increased their operations to between 70 and 75 per cent, the highest rate since last June.

Cincinnati—Sheet mill operations are steady, demand from automobile manufacturers and other consumers leading to the opinion there will be little or no recession this quarter from near-capacity schedules. Pressure for prompt shipments of full-finished sheets has not relaxed.

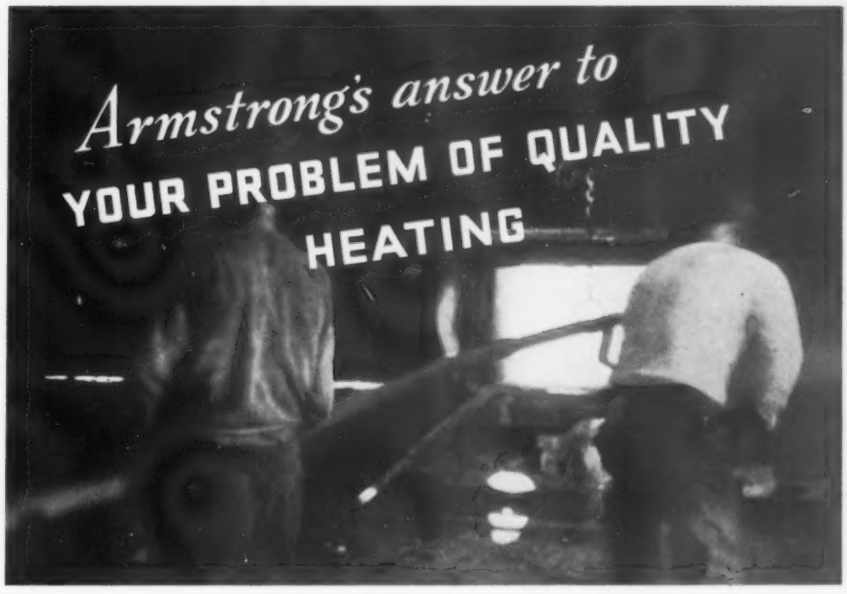
St. Louis—Sheet demand is holding up, and covers a wide variety of material. The leading producer reports business approximately 80 per cent better during the first five weeks this year than in the period last year. Galvanized sheets have developed notable improvement.

Birmingham, Ala.—New business continues to come out, and an increase in operations may be necessary shortly. Demand from the agricultural sections is good.

Cold Finished

Cold Finished Prices, Page 67

Pittsburgh—For the second consecutive week the market on cold



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UP TO 1600° F.
behind the refractory

Nonpareil Insulating Brick was introduced in 1914 for the insulation of high temperature equipment. And thousands of the brick installed twenty years ago are still in use. The weight of the standard brick (4½"x2½"x9") is only 1.8 pounds, with a crushing strength (cold) of 140 pounds per square inch. Like all Armstrong's Brick, it is machine-sized to give tight joints and economical laying.

UP TO 2500° F.
behind the refractory

Armstrong's Insulating Brick has proved its ability in countless installations to provide an efficient heat seal, without cracking, fusing, or spalling at temperatures as high as 2500°. The standard brick weighs only 2.2 pounds, and its crushing strength is 200 pounds per square inch. This efficient brick is available in a variety of shapes and sizes to meet every requirement.

UP TO 2475° F.
for direct exposure

Except where slagging action or extreme abrasion is present, Armstrong's EF Brick requires no fire brick protection. Thus, in addition to giving careful temperature control, this light-weight, semi-refractory brick permits thinner and lighter walls with a consequent shortening of heating time and speeding up of production. It is available in all fire brick shapes and sizes, and in special shapes up to 12"x24"x4½".

For additional information on Armstrong's High Temperature Brick, and samples, write Armstrong Cork Products Co., Insulation Division, 985 Concord Street, Lancaster, Pa.

Armstrong's
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finished steel bars has exhibited a decline in specifications. Shipments, however, are fairly steady. The downward tendency is doubtless caused by a temporarily over-bought condition among many automobile parts concerns, in addition to a decline in agricultural implement requirements. The 2.10c, Pittsburgh base, constitutes the going price, with 2.95c, Pittsburgh, quoted on alloy quality cold-drawn bars.

Transportation

Track Material Prices, Page 67

Freight car awards in the first half of February are the largest for any month since June, 1933, when 1835 cars were placed. Last week 804 cars were ordered in three lots; 500 by Northern Refrigerator Co., Grand Rapids, Mich., from Merchants Despatch Inc., Buffalo, 300 steel and wood automobile box cars for Cincinnati, New Orleans & Texas Pacific, from Pressed Steel Car Co., Pittsburgh, and four tank cars by Pennsylvania Salt Mfg. Co., Philadelphia, from General American Transportation Corp., New York.

New York Central has asked the interstate commerce commission to approve notes for $1,500,000 to PWA as security for a loan to finance 20,000 tons of rails and sufficient fastenings to lay them.

Seattle has rejected bids for 1000 tons of relaying rails for the municipal street railway line and new bids will be asked.

Cleveland Railway Co., Cleveland, has purchased 600 car wheels from Carnegie Steel Co., Pittsburgh.

Car Orders Placed

Cincinnati, New Orleans & Texas Pacific, subsidiary of Southern Railway system, 300 wood and steel automobile box cars, to Pressed Steel Car Co., Pittsburgh. Work to be done in the latter's McKees Rocks, Pa., shops.

Northern Refrigerator Co., Grand Rapids, Mich., 500 refrigerator cars to Merchants Dispatch Inc., subsidiary of the New York Central; Merchants Dispatch also awarded repairs to 400 refrigerator cars by the New York Central.

Pennsylvania Salt Mfg. Co., Philadelphia, four tank cars, to General American Transportation Corp., New York.

Rail Orders Pending

Virginian, 2000 tons rails, inquiry issued.

Semifinished

Semifinished Prices, Page 67

A slight decline in the rate of tin mill operations has interrupted tin bar shipments, but sheet and strip mills are taking in heavy tonnages of billets and sheet bars. Rerolling billets are in poor demand, compared to a steady rate of activity in forging quality billets. Wire rod shipments have flowed up. Prices are steady.

Pipe

Pipe Prices, Page 67

Pittsburgh—Replacement of several existing eastern gas and gasoline pipelines is reported as a favorable factor in the pipe market. Recent reports concern complete replacement of a 32-year-old line in New Jersey; also a line through Pennsylvania. It is now felt that this type of work may come before new line pipe construction, although some projects in the latter classification still are being favorably considered. The Texas Panhandle-St. Louis-Detroit natural gas line is prominent in the latter group, but there is reason to expect that the line to Detroit might originate in the Kentucky gas fields rather than Texas. The 12,500-ton pipe inquiry from Rio de Janeiro, Brazil, now develops to be for 48-inch pipe, and therefore, a project for plate fabricators. A good volume of carbon and alloy mechanical steel tubing continues to move and there have been some fair orders recently for boiler tubes and standard pipe.

Cleveland—Demand for small lots of steel pipe is fairly good, representing mainly jobbers' requirements, and industrial maintenance work. The market for cast pipe is slow.

Chicago—Cast pipe demand is slow to broaden and good activity is not looked for until next quarter when seasonal influences are expected to be reflected in construction work for waterworks, filter plants and sewage disposal facilities. Fair tonnage of pipe is involved in pending and proposed projects.

New York—Several thousand tons of cast pipe for the city is active with bids closed on part of these requirements. United States Pipe & Foundry Co., Burlington, N. J., is low on 1900 tons of cast pipe for a Yonkers project. Four additional New York contractors are letting jobs out, one closing Feb. 28, taking a substantial volume of steel pipe. Reduction of $4 a ton on certain classifications of structural pipe and butt welded steel pipe, at Gary, Ind., becomes effective Feb. 19 and 21, respectively. This change is understood to apply to classifications which are highly special and does not reflect any general trend in steel pipe prices.

Philadelphia—Continued substantial demands for oil country pipe, both steel and wrought, are making for substantial operations at two producing plants in this district. One producer of steel pipe still is operating at virtually 100 per cent capacity. Reflecting good operation at the plant of a wrought pipe interest are continued substantial purchases of pig iron.

Seattle—Prospects are improving although buying is of small proportions. Several large projects will be up for figures soon. Empire, Oreg., has a $10,000 federal loan for rehabilitation of its water system. Elma, Wash., has planned a project involving 12,000 feet of watermains and is awaiting approval of engineers.

Birmingham, Ala.—Demand for pressure pipe continues steady, with awards light. Labor troubles at one of the major plants has been adjusted and work resumed. Light inventories are noted at pipe shops here. Continued operations for two or three months at the present rate are anticipated.

Steel Pipe Placed

1130 tons, 28-inch flanged, Fort Peck, Mont., to Treadwell Construction Co., Midland, Pa.

Cast Pipe Pending

1900 tons, 30-inch and under, Yonkers, N. Y.; United States Pipe & Foundry Co., Burlington, N. J., low.

472 tons, 3½ to 8-inch, Veradale water district, Spokane; bids in.

300 tons, state hospital project, Kings Park, New York.

Steel Pipe Pending

1360 tons, 48-inch, borough of Queens, city water department, New York; bids Feb. 28.

1135 tons, 48-inch, 233rd street project, New York, city water department; Bronx Water Works Inc. low on general contract.

150 tons, 12 tanks, Passaic valley water commission, Paterson, N. J.; bids soon.

Unstated tonnage, 24,600 linear feet, bridge railing, Triboro bridge, New York; bids March 14 to Triboro bridge authority, New York.

Tin Plate

Tin Plate Prices, Page 66

Pittsburgh—Canmakers' tin plate specifications are lighter, and several producers have reduced operations. The average for the tin plate industry has declined 15 points to 70 per cent. A heavier volume of canmakers' orders, however, is expected in

March. Pronounced activity in cold-rolled tin plate still is noted.

New York—No recession is noted in tin plate specifications. Demand continues heavy.

Philadelphia—Substantial specifications for tin plate for oil containers are being placed here, and in the adjacent Baltimore district orders are heavy for a variety of purposes. Specifications generally are exceeding those of a year ago.

Strip Steel

Strip Prices, Page 67

Pittsburgh—Strip steel shipments are larger than specifications, although many strip steel producers consider themselves sold out until April 1 on a two-turn daily basis. These producers are purposely not working the third turn to conform with code hourly labor provisions. Therefore, it is fair to place strip mill operations at close to 65 per cent. According to present indications, 2.60c, Pittsburgh or Cleveland, will be the second-quarter market on cold-rolled strip, as will 1.85c, Pittsburgh, on hot strip.

Cleveland—New orders for strip have tapered off, mainly because automobile manufacturers have placed most of their requirements for this quarter, and business from other sources is light. Mills can take additional tonnage for this quarter, and can give deliveries in two to three weeks. Current prices are being reaffirmed for second quarter.

Chicago—Strip shipments continue heavy despite lessened buying. Producers are fairly well booked on cold-rolled material for March and anticipate a steady demand for hot-rolled strip during the same period. Automotive demand shows no improvement though requirements of this industry as well as of miscellaneous users reflect steady operations. Deferred deliveries are necessary in some instances and continuation of present prices is anticipated on second quarter business.

Boston—Cold strip buying has improved slightly, both hot and cold narrow widths lagging. Operations, however, have held against a recent increase in volume, which although limited, has been steady.

Philadelphia—Strip prices are expected to be reaffirmed for second quarter at 1.85c, Pittsburgh, or 2.14c, Philadelphia, on widths up to 24 inches, and cold strip at 2.60c, Pittsburgh, or 2.89c, Philadelphia. Demand for the narrow widths is increasing slightly, though trading is still far from active.

Metallurgical Coke

Coke Prices, Page 67

Domestic heating coke continues to make up most of the going tonnage although several small inquiries are current for furnace coke from several water gas producers. Foundry grades, however, are in poor demand at Pittsburgh and buying is hand-to-mouth. Connellsville, Pa., beehive coke oven market holds until March 1 at the earliest on the unchanged basis of $3.85 for furnace coke, $4.60 for foundry coke, common brands, and around $5.10 to $5.35 per ton for premium grades.

Chicago cokemakers find demand for foundry coke increasing over the January rate and deliveries are the best in nearly five years. At Cincinnati also foundry coke needs are heavier with sales on a spot basis after renewal of some heavy tonnage contracts. By-product plants at St. Louis have increased output as stocks have been reduced sharply.

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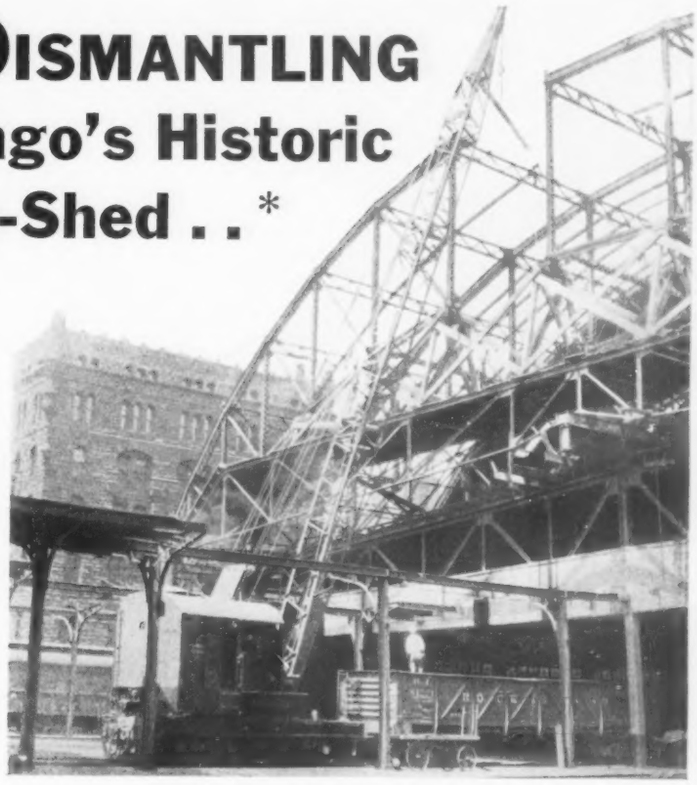

*Described in Nov. 17th Railway Age and December 20th Engineering News Record.

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Shapes

Structural Shape Prices, Page 66

New York—Structural awards are light, but inquiry is slightly heavier, with several thousand tons active for schools and bridges. Mill quantity extras on shapes and plates again have been postponed for three months.

Bids will be taken March 14 on 33,000 tons of shapes for suspended spans and viaduct approaches for the Triboro bridge, New York. Plans have been completed calling for 20,000 tons additional for the superstructure on which bids are expected shortly.

Fabricated structural steel continued to decline during January, according to the American Institute of Steel Construction. Bookings were approximately 38 per cent less than the yearly average for 1934, and 45 per cent less than for the same month last year. Shipments were approximately 20 per cent lower than the average for the preceding six months, but showed a 15 per cent increase over the average for the first six months of 1934, and were 52 per cent greater than for January, 1934.

Pittsburgh—Bids have been asked by the Pittsburgh & Lake Erie railroad on 200 tons required for a canopy shed at Pittsburgh. Plain structural shapes hold at 1.80c, Pittsburgh, but with the fabricating industry engaged at only 25 per cent, fabricated and erected prices are weak.

Cleveland—Interest here centers in bids to be taken this week on 650 tons of shapes and reinforcing material for a blower building at Cleveland's easterly sewage disposal plant. International Harvester Co. is taking bids on 180 tons for a building at Springfield, O., and Nickel Plate railroad on 150 tons for a bridge at Muncie, Ind. Awards are light.

Chicago—Advices are that bids will be asked on the Mississippi river dam at Alton, Ill., about April 1. This will be one of the largest structures to be built on the river and is expected to require about 10,000 tons of fabricated shapes, piling and concrete bars. Inquiries elsewhere are small, all involving less than 1000 tons. Bids have been opened on 2300 tons for Illinois bridge work.

Philadelphia — Structural activity is devoid of outstanding tonnage, although some scattered orders are being placed. Formal awards still are to be placed for the structural steel for the local naval aircraft factory and the North-side postoffice, both requiring fairly substantial tonnages. Shape prices are expected to be reaffirmed for second quarter at 1.90c, Bethlehem, Pa., or 2.00½c, Philadelphia.

Boston—Small-lot inquiry, postoffices especially, has improved, but the total demand for structural steel is light. Awards total about 500 tons, including 340 tons for a United Drug Co. building. New inquiry is light, 500 tons for bridge pending in Massachusetts and Connecticut.

Seattle—While some awards are pending, no new business of consequence has developed. Local plants are fairly busy on old commitments. American Bridge Co., Pittsburgh, has been awarded 200 tons for framework for the government warehouse, Coulee dam, Washington. Colonial Construction Co., Spokane, has the general contract for the Flathead river bridge, Montana, requiring 680 tons of shapes, reported awarded to unnamed interests.

Shape Contracts Placed

1450 tons, state bridge, East St. Louis, Ill., to American Bridge Co., Pittsburgh.

1260 tons, two state highway bridges, Wyandotte and Reno counties, Kansas, to Kansas City Structural Steel Co., Kansas City, Mo.

1050 tons, two highway bridges, Pawnee and Osage counties, Oklahoma, to McClintic-Marshall Corp., Bethlehem, Pa.

920 tons, two highway bridges, Osage and Caddo counties, Oklahoma, to J. B. Klein Iron & Foundry Co., Oklahoma City, Okla.

850 tons, highway bridge, Mountain county, Oklahoma, to Muskogee Iron Works, Muskogee, Okla.

680 tons, Flathead river state bridge, Montana, to unnamed interests; Colonial Construction Co., Spokane, general contractor.

630 tons, police headquarters, Buffalo, to R. S. McManus Steel Construction Co., Buffalo.

450 tons, highway bridge, Cloud county, Kansas, to Pittsburgh-Des Moines Steel Co., Des Moines, Iowa.

400 tons, state bridge, Washington county, Illinois, to Worden-Allen Co., Milwaukee.

370 tons, overpass, Morgan City, La., to Jones & Laughlin Steel Co., Pittsburgh.

335 tons, prison building, Bordentown, N. J., to American Bridge Co., Pittsburgh.

Shape Awards Compared

	Tons
Week ended Feb. 16	**12,535**
Week ended Feb. 9	**20,305**
Week ended Feb. 2	**10,052**
This week in 1934	**34,751**
Weekly average, 1934	**16,284**
Weekly average, 1935	**14,018**
Weekly average, January	**13,660**
Total to date, 1934	**135,247**
Total to date, 1935	**98,129**

300 tons, piling, lock and dam, awarded by United States engineer, Wilmington, N. C., to the Carnegie Steel Co., Pittsburgh.

300 tons, state prison buildings, Reidsville, Ga., to Ingalls Iron Works Co., Birmingham; Struck Construction Co., Louisville, Ky., general contractor.

300 tons, Daily News building, Brooklyn, N. Y., to Ingalls Iron Works, Verona, Pa.; through Hegeman-Harris Co.

300 tons, state highway bridge, Red Cedar, Wis., to McClintic-Marshall Corp., Bethlehem, Pa.

260 tons, Pennsylvania state highway bridge, Dushore, Pa., to McClintic-Marshall Corp., Bethlehem, Pa.

250 tons, public school No. 2, Queens, New York, to American Bridge Co., Pittsburgh; through Instig & Weil.

250 tons, public school No. 80, New York, to American Bridge Co., Pittsburgh; through Anthony Construction Co.

230 tons, Pennsylvania state highway bridge, Collegeville, Pa., to American Bridge Co., Pittsburgh.

220 tons, state bridge, Macoupin county, Ill., to Clinton Bridge Works, Clinton, Iowa.

200 tons, transfer bridge, Pennsylvania railroad, New York, to American Bridge Co., Pittsburgh.

200 tons, government warehouse, Coulee dam, Washington, to American Bridge Co., Pittsburgh.

200 tons, building, Santos, Brazil, to Muskogee Iron Works, Muskogee, Okla.

165 tons, dormitory building, teachers college, Albany, N. Y., to Smith & Caffrey Co., Syracuse, N. Y.

145 tons, bridge, Upshur county, Texas, to Austin Bros., Dallas, Tex.

125 tons, state bridges, Nebraska, to Omaha Steel Works, Omaha.

125 tons, bridge, Polk county, Missouri, to Kansas City Structural Steel Co., Kansas City, Mo.

120 tons, plant addition, Sylvania Industrial Corp., Fredericksburg, Va., placed through the Hughes Foulkrod Co., Philadelphia, with the Belmont Iron Works, Philadelphia.

120 tons, Virginia state highway bridge in Hanover county, to Virginia Bridge & Iron Works, Roanoke.

120 tons, overpass, Monroe, La., to Jones & Laughlin Steel Co., Pittsburgh.

110 tons, postoffice, Rockingham, N. C., to Dietrich Bros., Baltimore.

100 tons, bridge, Rutland, Vt., to American Bridge Co., Pittsburgh.

Shape Contracts Pending

33,000 tons, suspended spans and viaduct approaches, Triboro bridge, New York; bids March 14 to Triboro bridge authority, New York.

2000 tons, two approaches to St. Louis municipal bridge; $1,103,000 allotted by PWA.

1400 tons, grade crossing, Long Island railroad, St. Albans, N. Y.

750 tons, state armory, Minneapolis.

580 tons, four state highway bridges, Oklahoma.

500 tons, bridge over Wallabout canal, Brooklyn, N. Y.

500 tons, building, Wander Co., Villa Park, Ill.; new specifications drawn.

360 tons, state highway bridge, Rumford, Me.

300 tons, state bridges, Indiana.

225 tons, state bridges, Nebraska.

220 tons, state bridge, Bourne-Wareham, Mass.; bids Feb. 26, department of public works.

206 tons, state bridge, Clearwater river, Idaho; Interstate Engineering & Construction Co., Newport, Wash., low.

200 tons, Leyden school, Chicago.

200 tons, canopy shed, Pittsburgh, for

Pittsburgh & Lake Erie railroad station.
190 tons, state highway bridge, Beatrice, Nebr.
180 tons, building, for International Harvester Co., Springfield, O.
150 tons, bridge at Muncie, Ind., for Nickel Plate railroad, Cleveland.
130 tons, Enterprise department store, Brockton, Mass.; bids in.
130 tons, building additions, Lever Bros., Boston.
100 tons, bridge, Crossville, Ill.

Reinforcing

Reinforcing Bar Prices, Page 67

Pittsburgh — Redesign of the Wheeling, W. Va., postoffice, originally a 400-ton structural steel project, is in progress, with some probability that a reinforced concrete design may be employed. Bids are being taken Feb. 21 by the Zanesville, O., engineers on 600 tons for the Beach City dam, Dover, O., and 75 tons for the Senecaville dam, Cambridge, O. The new billet steel bar market is steady on the basis of 2.05c, Pittsburgh, as quoted by distributors for cut lengths, and 1.90c, Pittsburgh, for rail steel bars.

Cleveland—Award of 2400 tons of reinforcing bars for the Muskingum, Ohio, conservancy district dams, is expected shortly by the United States engineer, Zanesville. The seller who entered a low bid of $2 a ton under the established market on about half the tonnage submitted photostatic copies of work sheets to prove that the figure it submitted was a mistake. It probably will be permitted to withdraw its bid. The general market is quiet, with few individual orders exceeding 100 tons.

Chicago—Awards are limited almost wholly to lots of less than 100 tons and these are small in the aggregate. Highway contractors have yet to start construction on a large scale in this and nearby states and purchases of bars for this purpose are deferred. About 1500 tons of bars will be required for the Mississippi river dam at Alton, Ill., on which bids are expected to be asked early in April. Bar sellers are figuring a number of postoffices, practically all of which take only small tonnages. One exception is a Phoenix, Ariz., postoffice involving 150 to 250 tons, another being the Des Moines, Iowa, postoffice for which 130 tons have been placed.

New York—The market is sluggish, but more inquiries are appearing for small lots. Frederick Snare Corp., New York, is low bidder for the Triboro, New York, bridge piers, requiring 750 tons.

Boston—The local rail steel bar mill has booked the bulk of recent bar orders in this district, the total volume being light. Prospects for highway needs during the coming season in Massachusetts are not encouraging. Small-lot inquiry is active, but buying is delayed.

Philadelphia—Irwin & Leighton, general contractors, this city, are low on government barracks at Carlisle, Pa., requiring 230 tons of bars. These contractors have the contract for the naval aircraft factory here, requiring 650 tons of bars, and on which no action yet has been taken. The Pennsylvania railroad has applied for $5,000,000 loan from the PWA for 40

Concrete Awards Compared

	Tons
Week ended Feb. 16	2,165
Week ended Feb. 9	867
Week ended Feb. 2	1,562
This week in 1934	5,206
Weekly average, 1934	4,084
Weekly average, 1934	3,217
Weekly average, January	3,898
Total to date, 1934	29,566
Total to date, 1935	29,521

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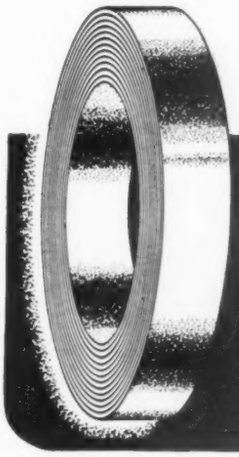

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grade elimination crossings in southern New Jersey. This work, it is said, is on lines jointly operated by the Pennsylvania and Reading railroads.

Seattle—Recent awards have been limited to less than 100 ton lots, but prospects are improved and the market is firm. Business pending includes 435 tons for the Moon Lake dam, Utah, for which bids were opened Feb. 4 by reclamation bureau, Gunnison, Colo. The same bureau will receive bids Feb. 18 for the Taylor Park, Colo., project which will require 226 tons of reinforcing, and 261 tons of steel for gates and cranes.

Reinforcing Steel Awards

800 tons, state prison buildings, Reidsville, Ga., to Kalman Steel Corp., Bethlehem, Pa.; Struck Construction Co., Louisville, Ky., general contractor.

325 tons, bridge and approaches, Bass river, Dennis-Ramouth, Mass., divided between Northern Steel Co., Boston, and Kalman Steel Corp., Bethlehem, Pa.

320 tons, grade separation and bridges, Kings and Queens counties, New York, to Carroll, McCreary Co. Inc., Long Island City, N. Y.; through New York & New Jersey Engineering Corp.

200 tons, sewer, Brooklyn, N. Y., to Igoe Bros., Newark, N. J.; through P. Thomasetti Contracting Co.

13 tons, Pennsylvania state bridge and road, awarded through Benjamin Foster, general contractor, Philadelphia, to Kalman Steel Corp., Bethlehem, Pa.

130 tons, postoffice, Des Moines, Iowa, to Concrete Engineering Co., Chicago.

125 tons, bridge and approaches, Westfield, Mass., to Northern Steel Co., Boston.

125 tons, bridge over Erie railroad, Pompton Plains, N. J., to Igoe Bros., Newark, N. J.; through Franklin Contracting Co.

Reinforcing Steel Pending

435 tons, also 135 tons gates and liner plates, Moon Lake dam, Utah; T. E. Connolly, San Francisco, low.

170 tons, highway, Cheshire, Mass.; bids Feb. 19.

150 tons, postoffice, Phoenix, Ariz.; alternate design involves 250 tons.

150 tons, addition to Homer Phillips hospital, St. Louis; H. B. Deal & Co., St. Louis, low.

135 tons, outfall sewer, Hartford, Conn.; bids March 5.

105 tons, state bridge, Bitterroot river, Montana; Colonial Construction Co., Spokane, general contractor.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 67

Nut and bolt manufacturers have not decided on prices for second quarter, but an announcement is expected shortly. There are no code regulations requiring the filing of prices at specific times as in steel.

At Cleveland specifications from automobile manufacturers last week increased, in contrast with slower demand from other leading consumers.

Volume of bolt, nut and rivet buying so far in February has been slightly ahead the same period of January at Pittsburgh. The large rivet trade is adversely affected by lack of railroad car repair work and a slow structural market.

Warehouse

Warehouse Prices, Page 70

Pittsburgh—Buying of warehouse steel products is increasing. Through the first 15 days of February, warehouse business locally was in excess of the same period in January.

Cleveland—Warehouse sales last week diminished due to the holiday, but the average for the month is as good or slightly better than in January. Light structural shapes are in better demand than plates, while the market for sheets is quieter.

Chicago—Sales show a gain over January and are heavier than a year ago. Diversification in demand continues, with more orders from small miscellaneous users noted. Activity compares favorably with best periods of 1934. Prices are unchanged.

Boston—Boiler tube prices out of warehouse have been revised downward slightly, in line with mill changes, Pittsburgh base applying in this territory. Sales are holding to last month's totals, with miscellaneous buying steady.

Philadelphia—Daily business is beginning to fall under the average rate for last month, according to some leading jobbers here. While February and January are usually rather dull, some disappointment is being felt over failure of current business to hold up to at least the level of last month. However, bookings this year exceed those for the corresponding period in 1934.

Detroit—Warehouse business is steady, holding at about the improved level established in January. Activity is moderately better than a year ago.

Cincinnati—Industrial needs continue to be the backbone of demand for steel from warehouses, without much change in tonnage. Prices are

St. Louis—A further moderate expansion in sales of iron and steel from warehouses has appeared. Orders are mainly small and practically all for immediate requirements.

Seattle—Warehouse business is improving, volume being ahead of a month ago. Industrial buying is increasing.

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Wire

Wire Prices, Page 67

Pittsburgh—Wire product specifications last week showed no further gains in orders for manufacturing wire, spring wire and spoke wire. This branch of the industry has been carrying most significance when compared with the merchant trade. In the latter market, price-cutting uncertainties caused by recent reductions on nails and other items by mail order houses has obviously restrained jobbers from building up stocks. Although leading mail order houses are importing barbed wire, no sizeable quantities of foreign-made nails have been distributed through these channels.

Cleveland—Little change is noted in volume of new business and wire mill operations hold at 60 per cent. Some sellers note considerable improvement in demand for plain and barbed wire and wire fencing from agricultural districts, orders being received two to three months ahead, though not formally entered beyond first quarter. Demand from jobbers generally, however, is not moving up as rapidly as usual at this time of year.

Chicago—Wire demand is fairly steady. Some miscellaneous consumers still experience expanding requirements, though automotive buying shows little change.

Boston—Wire demand holds well with some increase in finishing operations. Demand is broader and releases heavier, increased activity in part being due to orders to be shipped before the end of the quarter on current contracts.

New York—Slight reductions in farm and field fencing, effective at Pittsburgh, Feb. 23, has been posted with the American Iron and Steel institute.

Pig Iron

Pig Iron Prices, Page 68

Pittsburgh—Reciprocity arrangements affecting pig iron shipments continue to exert a dominating influence in the local market and local rollmakers continue thereby to account for their absence in open market purchases. Furthermore, a decline in cast scrap of 50 cents a ton the past week has further enhanced the latter's prominence from a cost standpoint in the foundry melt. There have been no large basic or bessemer inquiries or orders recently.

Cleveland—Producers appear confident they will ship more pig iron and by-product foundry coke in the 28 days this month than in the 31 in January. This is indicated by the releases in hand, and continuing improvement in demand from automobile manufacturers, most of whom have light stocks. Some decline is noted for manufacturers of heating apparatus. Prices are being filed Feb. 18 at unchanged levels to apply March 1 on orders for second quarter.

Boston—Pig iron sales are in small lots. Rate of consumption in the aggregate has not improved materially with 30-35 per cent of capacity estimated for foundry operations. Substantial inquiry is lacking, buyers taking iron in small shipments as required.

Chicago—Recent upturn in pig iron shipments is continuing but at a considerably slower rate than prevailed in January. Deliveries for the month are expected to show a further increase on a daily basis, though the shorter month may bring a small decrease in total tonnage. Foundry operations generally are well maintained, particularly in the automotive and farm implement industries. What slackening is evident

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DETROIT

in schedules of other foundries usually is confined to jobbing shops and small plants. The market continues $18.50, furnace, for No. 2 foundry and malleable. Indications are lacking of a change in this figure on the opening of second quarter books next month.

New York—So far this month pig iron shipments have shown little gain over the January rate and, generally speaking, business has proved disappointing. Orders are for spot shipment and with few exceptions are not for more than 100 tons each. Prices probably will be reaffirmed for second quarter.

Philadelphia — Apart from substantial buying by the Reading Iron Co., Reading, Pa., recently noted, pig iron orders continue generally restricted to small lots. Sellers are expected to reaffirm existing prices for second quarter.

Buffalo — A steady demand for iron keeps sales and inquiries decidedly on the up-grade. A merchant furnace interest here is planning to add a second stack on or before April 1. Inquiry for barges to move iron to the seaboard on the opening of navigation has appeared. Shipments are at or near the best point since last June.

Cincinnati — Spot orders for pig iron, some reflecting better conditions among smaller foundries, are accounting for a heavier tonnage. January shipments were the best in several years, exclusive of periods in which there was code and price stimulus. This level of shipments is being maintained.

St. Louis—While some tapering off in pig iron shipments has been noted, the average daily rate thus far in February is still substantially above that of January. Indications are that the February total will exceed that of the preceding month and mark the fifth month of successive gains. Practically all melters are accepting full quotas due on contracts and there have been a number of requests to expedite deliveries. Bulk of the iron moving is foundry grades, but the aggregate has been lifted by heavier shipments of basic iron.

Birmingham, Ala.—Orders for pig iron continue small. Eight furnaces are now in operation, with prospects for two additional stacks to resume during the month.

Toronto, Ont.—Merchant pig iron sales gained during the week with total awards close to 600 tons. The daily melt gradually is increasing and is now approximately 40 per cent. Pig iron production is holding about 1200 tons per day with three stacks blowing.

Scrap

Scrap Prices, Page 69

Pittsburgh—Excepting a Johnstown, Pa., buyer Pittsburgh district scrap consumers have now completely withdrawn from the market. The Johnstown, Pa., buyer, however, has bought most of the Pennsylvania railroad's recent heavy melting steel tonnage at $13.95 per ton, delivered, and furthermore, has issued dealers' orders indicating the $13.25 per ton commitment. In the more immediate Pittsburgh district, heavy melting steel is without takers, with brokers' nominal offers to sell at $13 a ton. Heavy cast scrap has declined 50 cents, railroad specialties are weak, and blast furnace borings and turnings are now representative at $7 to $8 a ton, owing to two distinct prices being paid for local delivery.

Cleveland—After some weakness in scrap early in the week strength has followed, with prices well maintained without change. Cleveland consumers are asking that shipments be held back but valley melters are allowing shipments to move forward. Supplies are being held closely in expectation of further advance.

Chicago—Steel scrap prices generally are steady, following additional purchases of No. 1 heavy melting steel at $12.75. Trend of prices remains obscure but a fairly even balance between supply and demand steadies quotations. Mills continue to refrain from accumulating extensive stocks. Railroads are disposing of only moderate lots.

Boston—At unchanged prices activity in scrap is largely for export with heavy melting steel, stove plate and No. 2 cast most active. Domestic consumers are taking in scrap at prices unchanged from the recent delivered quotations, although the volume is not large.

New York—Heavy melting steel grades are strong with $9.50 for No. 1 and $8 for No. 2 barge, being paid more frequently, an advance of 50 cents. Stove plate is also stronger. Most activity is for export.

Philadelphia—A fairly substantial tonnage of No. 2 steel has been purchased by the Pencoyd, Pa., consumer at around $10, delivered. As specifications are rigid, the material bought is demanding a higher price than the $9.50, wharf, being paid for export material. Buying otherwise is featureless and an easier tone has developed. However, domestic prices generally show no change.

Buffalo—Dealers are buying scrap heavily for orders on hand or in prospect. Dealers offer $12.50 for No. 1 heavy melting steel, according to reports, although one large consumer also is said to be offering this price for material delivered at his works and shipped in from outside sources.

Detroit—Iron and steel scrap is weaker with lower prices on open-hearth grades expected when buying resumes. Automotive scrap production is heavy and the market is overloaded. Heavy melting steel is unchanged but compressed sheets, borings and turnings are lower.

Cincinnati—Dealers in iron and steel scrap are offering lower prices, averaging 50 cents a ton, attributed to cessation of buying by several important melters. Shipments are

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heavy. Miscellaneous sales are being made below recent peaks and dealers are not interested in building up yard stocks. Current railroad offerings are normal.

St. Louis—The market shows little change. Purchasing is on a hand-to-mouth basis, the only sale of size reported being 5000 tons of No. 2 heavy melting steel by an east side mill at the market, for delivery over the next 60 days.

Seattle—Japanese buyers are hesitant in placing new business. However, the Orient is interested and as soon as exchange has been settled new orders will be placed. Exporting houses are maintaining firm ideas as to prices. The movement on contracts is active.

Birmingham—Dealers in steel and iron scrap see signs of increased demand shortly as steel production increases. Stocks are ample and prices are steady.

Toronto, Ont.—Iron and steel scrap trading is steady. Mills in the Hamilton district are responsible for a good movement of heavy melting steel and there is some call for steel and wrought iron axles in the Montreal market. Foundries are maintaining steady demand for wrought scrap and No. 1 machinery cast and there has been a slight gain in sales of malleable. Dealers are out of the market and offerings are light.

Nonferrous Metals

Nonferrous Metal Prices, Page 68

New York—Nonferrous metal markets were featured last week by a rise of $1 a ton in lead and a severe slump in Straits tin prices. Demand for most metals was in fair volume.

Copper—Tone of the market continued buoyant here while it firmed abroad. Allocated copper sales held up well with copper and brass mills active in the market. Negotiations toward an international marketing plan are progressing and a formal world conference is still considered likely.

Zinc—Despite surface indications of dullness, it is believed fairly active business was done quietly. It is estimated that slab zinc bookings totaled about 3500 tons or the same amount for the previous week. Prices hold steady on the basis of 3.70c, East St. Louis, for prime western spot.

Lead—Active buying of lead was reflected in an advance in prices to 3.55c, New York, and 3.40c, East St. Louis, for spot through March. St. Joseph Lead Co. continued to quote $1 a ton premium on the New York basis. Leading sellers held their bookings to daily ore intakes. Buying was well diversified with corroders especially active.

Tin—Depressed by sharp declines on the London Metal exchange, Straits spot dropped to 49.85c, New York, on Thursday but regained part of the loss on subsequent trading. Sales were very small with buyers awaiting future developments. Unsettled conditions in London commodity markets were due to failure of three old established firms there. Outlook for tin consumption here is favorable with tin plate operations holding around 80 per cent of capacity.

Antimony—Buying interest was lacking but prices held generally unchanged with Chinese spot at 14.50c, duty paid, New York.

Aluminum—Virgin and remelt prices held unchanged in quiet markets.

Ferroalloys

Ferroalloy Prices, Page 68

Ferromanganese shipments continue brisk. Prices, it is believed, will either be reaffirmed or advanced this week for second quarter.

Notwithstanding possible lower duties later on imported material, as a result of the proposed reciprocal arrangement with Brazil, the market abroad on manganese ore appears stronger. The going market on ferromanganese is $85 duty paid, Atlantic and Gulf ports. Domestic spiegeleisen, 19 to 21 per cent, is moving in better volume at the unchanged prices of $26, furnace, on quantities up to 50 tons, and $24 on 50 tons and over.

Steel in Europe

Foreign Steel Prices, Page 70

London—(*By Cable*)—Output of steel ingots and castings in Great Britain in January increased approximately 16 per cent over December, to 757,800 gross tons. Daily average output in December was 25,153 tons and in January 28,066 tons. Pig iron production increased from 513,500 gross tons in December to 521,200 tons in January, about 1.5 per cent. Daily average production was 16,564 tons in December and 16,813 tons in January. Active stacks Jan. 31 numbered 94, against 96 Dec. 31.

Domestic demand for pig iron is quieter, but exports are expanding, especially to Italy, Scandinavia, South Africa and the Far East. Steelworks are well booked and have a fair volume of spot business. Sheet exports are improving, with larger inquiry from the Argentine. Galvanized sheets are quiet.

Export trade from the Continent is slack. Germany has sold some structural steel for the Far East. Domestic trade in France is declining.

Allis-Chalmers Mfg. Co., Milwaukee, has moved its branch office at Pittsburgh to 2037 Koppers building. Guy V. Woody is manager for the Pittsburgh district.

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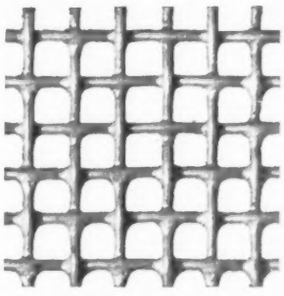

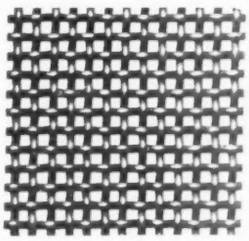

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Production

(*Continued from Page 17*)

stepping operations up slightly and increases at two other producing plants, holding central eastern seaboard operations unchanged at 31 per cent, with little variation expected this week.

Cleveland-Lorain also registered a decline last week, going down 5 points to 77 per cent, with Corrigan, McKinney Steel Co. operating 12 open hearths, Otis Steel Co. 7 and National Tube Co., Lorain, 11. For the third consecutive week, Buffalo operations held steady at 45 per cent and probably will remain at this level until the end of the quarter.

Resumption of operations at the Ensley rail mill of the Tennessee Coal Iron & Railroad Co. brought the production rate in the Birmingham district up 23½ points to 55½ per cent, and a possible rise to 60 per cent this week is anticipated. Ingot production in the New England district held at 63 per cent last week, and little change is expected this week.

Ford Motor Co. and Great Lakes Steel Corp. still continue to schedule all open hearths, maintaining the Detroit district operating rate at 100 per cent.

U. S. STEEL CORP. SHIPMENTS

(Inter-company shipments not included)

(Tons)

	1935	1934	1933	1932
Jan.	534,055	231,777	285,138	426,271
Feb.	.....	385,500	275,929	413,001
March	.....	588,209	256,793	388,579
April	.....	643,009	335,321	395,091
May	.....	745,063	455,302	338,202
June	.....	985,337	603,937	324,746
July	.....	369,938	701,322	272,448
Aug.	.....	378,023	668,155	291,688
Sept.	.....	370,306	575,161	316,019
Oct.	.....	343,962	572,897	310,007
Nov.	.....	366,119	430,358	275,594
Dec.	.....	418,630	600,639	227,576
Yrl. adj.	.....	.....	44,283	5,160
Total	.....	5,925,873	5,805,235	3,974,062

SHIPMENTS IN SHARP GAIN

Shipments of finished steel by the United States Steel Corp. in January were 534,055 tons, an increase of 115,425 tons from the 418,630 tons shipped in December. Shipments for January, 1934, were 331,777 tons, January, 1933, 285,138 tons and January, 1932, 426,271 tons. Other comparisons are shown in the accompanying table.

Foreign Trade

SECRETARY of State Hull, who ten days ago halved the tariff on manganese ore from Brazil in a reciprocal tariff agreement with that country, cried "propaganda" last week when congressional delegations from manganese-producing states began building a backfire.

A committee, Senators Murray, Montana, and McCarran, Nevada, and Representatives Greenway of Arizona, Mill of Arkansas, Christianson of Minnesota, and Scrugham of Nevada, is drawing a resolution to prevent consumation of the reduction of duty on Brazilian ore and to prevent extension of the tariff to other countries.

Secretary Hull, an old line free trader, maintained that the proposed reduction on manganese from 1l0 per cent to 55 per cent, or from 1 cent a pound to ½ cent will not throw many workers out of employment and "even McKinley or Dingley would not have fixed the rate so high in the first place."

Another tariff embarrassment for Democrats arose last week when the American Steel & Wire Co. decided to suspend operations at its Farrell, Pa., plant March 1. According to the company, a subsidiary of the United States Steel Corp., protection on wire fencing is necessary before the plant can operate profitably. (Only duty is on galvanized wire fencing, ½-cent per pound).

Shenango valley industrial leaders have appealed to Sen. Joseph Guffey, first Democrat in the senate from Pennsylvania in half a century to ask this tariff protection.

Financial

AS USUAL, steel producers are slow in announcing their showing for the fourth quarter and presenting final statistics for the year, but on the basis of returns from companies representing 65 per cent of the country's ingot making capacity, the indicated deficit for the entire industry in 1933 is just short of $22,000,000. This is about half the loss of 1933. A comparison of 1934 with 1933, after all charges, by leading companies reporting thus far is as follows:

United States Steel Corp., 1934, deficit of $21,701,904; 1933, deficit of $36,501,123. Bethlehem Steel Corp., 1934, profit of $550,571; 1933, loss of $8,735,723. Youngstown Sheet & Tube Co., 1934, deficit of $2,588,784; 1933, deficit of $8,342,901. National Steel Corp., 1934, profit of $6,050,981; 1933, profit of $2,812,406. Inland Steel Co., 1934, profit of $3,730,331; 1933, profit of $166,693.

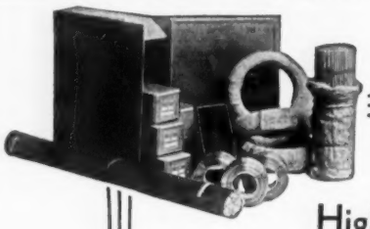
SEEK FUNDS FOR EXPANSION

Trustees of Follansbee Bros. Co., Pittsburgh, John Follansbee, George T. Ladd and Isaac M. Scott, have asked permission to issue not to exceed $500,000 of trustees certificates to permit expansion of operations of the company. Petition was filed in the federal district court for western Pennsylvania Feb. 9, and ruling was made returnable Feb. 16.

NATIONAL'S EARNINGS RISE

National Steel Corp., Pittsburgh, reports net profit of $6,050,722, equal to $2.80 per share in 1934, according to a preliminary statement. Net profit of the fourth quarter of 1934 was $1,467,825, equal to 68 cents per share.

By comparison, net profit reported



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by the company for 1933 was $2,812,407, equal to $1.30 per common share, and the net profit for the 1933 fourth quarter was $242,530, equal to 11 cents per common share.

¶Joseph T. Ryerson & Son Inc., Chicago warehouse interest, made $1,380,897, after charges, in 1934, against a net of $301,489 in 1933.

SHEET & TUBE WHITTLES LOSS

Youngstown Sheet & Tube Co., Youngstown, O., in a preliminary statement places its loss in 1934, after charges, at $2,578,785, against $7,815,529 in 1933, and $13,272,783 in 1932. Fourth quarter loss was $920,152, compared with $1,117,121 in the final quarter of 1933.

BYERS TRIMS LOSS

A. M. Byers Co., Pittsburgh, reports net loss of $220,230 for the fourth quarter of 1934, compared with net loss of $258,157 in the quarter preceding and $256,672 in the fourth quarter of 1933.

ALLEGHENY NET LARGER

Allegheny Steel Co., Brackenridge, Pa., reports net profit in 1934, after charges, of $835,927, against net of $292,017 in 1933.

COLORADO PAYS INTEREST

Colorado Fuel & Iron Co., Denver and Pueblo, Colo., on Feb. 1 paid bond interest totaling $112,500. There are now no arrears. A reorganization plan has been submitted.

OTHER FINANCIAL REPORTS

Sivyer Steel Casting Co., Milwaukee, 1934, net of $2287; 1933, loss of $51,261.

A. M. Castle & Co., Chicago, 1934, net of $390,349; 1933, net of $102,824.

Fostoria Pressed Steel Corp., 1934, net of $11,664; 1933, net of $914.

Allis-Chalmers Mfg. Co., Milwaukee, 1934, deficit of $1,039,406; 1933, loss of $2,893,905. Unfilled orders Dec. 31 totaled $8,013,859, against $6,425,998.

Harbison-Walker Refractories Co., Pittsburgh, 1934, net of $1,246,587; 1933, net of $760,276.

Chicago Railway Equipment Co., Chicago, 1934, net income of $61,290, after all charges; 1933, net loss of $115,935.

M. A. Hanna Co., Cleveland, fourth quarter net of $595,596, against third quarter net of $125,000.

DIVIDENDS DECLARED

Harbison-Walker Refractories Co., Pittsburgh, 25 cents on the common payable March 1, doubling previous rate, and regular quarterly dividend of $1.50 on the preferred.

M. A. Hanna Co., Cleveland, 25 cents on the common payable March 11, and $1.75 on preferred payable March 20.

American Rolling Mill Co., Middletown, O., $2 on its 6 per cent preferred, payable March 1 to record of Feb. 15. Last previous payment $1.50 on Jan. 15, 1933.

Copperweld Steel Co., Glassport, Pa., four dividends of 12½ cents each payable Feb. 28, May 31, Aug. 31 and Nov. 30, 1935.

Foreign

IN A temperature of 54 degrees below zero Fahr., blast furnace No. 4 at the Kuznetsk metallurgical plant in Soviet Russia was blown in Dec. 21, and after 21 hours was tapped for 182 tons of iron analyzing 4.86 silicon, 0.62 manganese, 0.01 sulphur and 0.16 phosphorus. The rated capacity of the stack, of American design, is 1100 tons daily.

Safety

BUFFINGTON, IND., plant of the Universal Atlas Cement Co., a subsidiary of the United States Steel Corp., completed 1934 without a single disabling accident, according to Gordon C. Huth, manager of the company safety bureau.

This made the Buffington plant eligible for the Portland Cement association trophy awarded annually to plants with an accident-free record for the calendar year. The company's Duluth plant is a six-time winner of the trophy, and its Pittsburgh plant a fourth-time winner.

OTIS HAS "SAFE" MONTH

Otis Steel Co., Cleveland, recently operated a full month without a lost-time accident, the first time in the history of the company that such a record has been made. Ten of the 37 departments in the plant have worked a year without a disabling injury.

¶Colorado Fuel & Iron Co., Denver and Pueblo, Colo., experienced no fatal accidents at its Minnequa works in 1934, and a reduction of 38 per cent in lost time due to accidents.

They Say:

SINCE man came to this planet, there have been managers. The first manager was the father of the family. When families began to live together, the patriarch, or head of the clan, was the leader or manager. Tribes built cities, and cities combined to make nations, and the managers were known as kings, emperors, princes, and later as presidents, governors, mayors. Religious bodies have managers called pastors, ministers, priests, bishops, and the ladies' guild has its manager or chairman. Lodges have a master; schools their teachers and principals. Stores have managers and buyers, and factories have foremen, superintendents and presidents. Armies and navies have officers. Even an informal gathering elects a temporary chairman if is is to conduct business.

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Managers are necessary to the conduct of any human activity where more than one individual is involved. There must be some one to preside when planning procedure and some one to put plans into effect. Not only does every human activity, involving more than one individual, require the function of management, but also the success of the activity is affected by the character of the management.

"Presently we are striving to effect recovery and re-employment. Recovery depends upon the soundness of plans and economic policies, upon the character of the management executing the plans and policies, and equally important, upon the co-operation of all concerned, with the management. Recovery depends on sound plans and policies, competent management, and co-operation with management. Co-operation with management means following the leader. It means giving assistance to the work to be done. It means "team work." Conversely it means to refrain from hindering in any way.

"Casting aspersions against managers and leaders is one of the great hindrances to the success of an enterprise. Maligning or unfair criticism destroys co-operation. Unfaithful managers should be punished and incompetent managers should be removed, but managers as a class should be supported. Management is a function inseparable from society. Only by co-operating with its manager can any group of society be successful in its plans, and only by co-operating with its manager can society progress and achieve recovery."—George P. Torrence, president, Link-Belt Co., Chicago.

Activities of Steel Users and Makers

OHIO FORGE & MACHINE CORP., Cleveland, successor to Gears & Forgings Inc., manufacturer of gears, speed reducers, forgings and special machinery, has appointed Denton & Anderson Co., 1225 West Washington boulevard, Chicago, its representative in the Chicago territory. George E. King will be in charge of sales, assisted by Clyde G. Bassler, C. A. Gould and John R. Poyser.

□ □ □

Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., is establishing a department for the development of new uses for steel.

□ □ □

Boston Gear Works Inc., North Quincy, Mass., has established a sales office in the Sexton building, Minneapolis, in charge of C. L. Mortenson, manager.

□ □ □

Bunting Brass & Bronze Co., Toledo, O., has established a branch office and warehouse at 3325 Locust street, St. Louis, where it will carry a complete stock of industrial bronze bearings, bronze bars, babbitt, electric motor bearings and similar products.

□ □ □

Elgin Softener Corp., Elgin, Ill., has taken over the Isometer Corp., Milwaukee, which will be removed to Elgin and operated as a division of the parent company. The principal product of the division is a flow meter using a variable orifice principle for measuring liquids and gases and designed to record pulsating flow.

□ □ □

W. G. Nichol Co., Milwaukee, machine tool dealer, has moved its offices from 1010 Mariner tower to 709 West Michigan street, to obtain space better suited to its needs for a display room.

□ □ □

Erman-Howell & Co. Inc., dealer in iron, steel and alloy scrap, car materials and storage tanks, has moved its offices to 332 South Michigan avenue, Chicago. The firm is composed of Walter Erman and Edwin G. Howell.

□ □ □

Mountain Hardwood & Stove Co., Guntersville, Ala., recently organized, has started operations. F. R. Blount, Chattanooga, Tenn., is president, Charles M. Brown is vice president and business manager, and E. R. Hay, Sequatchie, Tenn., is secretary.

□ □ □

Hamilton Coke & Iron Co., with offices at its plant, between Hamilton and Middletown, O., has bought the firm of Eaton, Rhodes & Co., Cincinnati, which has been its pig iron sales agent. Sales now are handled directly by the furnace company.

□ □ □

Lynch Corp., Anderson, Ind., T. C. Werbe president, manufacturer of glass bottle manufacturing machinery, is receiving an unusual volume of export orders, including a large order for Japan. The plant is operating at full capacity, with a night force.

□ □ □

Wesley Steel Treating Co., 1333 West Pierce street, Milwaukee, has obtained a license until 1941 for the Lake Michigan area for the special metal treating process of the Chapman Valve Co., Indian Orchard, Mass., and is building an addition 20 x 74 feet to house a continuous pusher-type furnace.

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Central Steel & Wire Co., with warehouses at Chicago, Detroit and Dayton, O., has been appointed a distributor of Armco stainless steel sheets, plates and strip by the American Rolling Mill Co., Middletown, O. Braco-Mueller-Huntley Inc., with warehouses at Buffalo, Rochester and Syracuse, N. Y., were given a similar appointment recently.

□ □ □

Homestead Valve Mfg. Co., Coraopolis, Pa., announces the following exclusive sales and distribu-

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The most flexible belt yet devised, because the spirals work freely on the reinforcing strut. The crimped reenforcement member eliminates tendency to shrink in width and elongate. Because it is balanced, it runs true. Balanced Spiral is available in all sizes and kinds of wire to suit your needs. Request full particulars.

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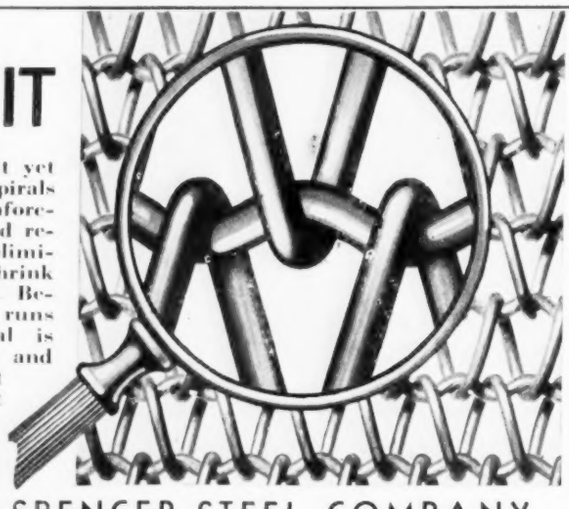

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tion representatives for its valve products: Carey Machinery & Supply Co., 119 East Lombard street, Baltimore; L. E. Livingstone, 2012 Ward Parkway, Fort Worth, Tex.; Charles A. Randorf, 83 Delham avenue, Buffalo, and Atkins-Kroll & Co., 260 California street, San Francisco, the latter also as exclusive representative in the Philippine Islands.

□ □ □

Timken Roller Bearing Co., Canton, O., has booked an order from the Pennsylvania railroad for bearings and boxes for all driving and other axles of 37 streamlined high-speed electric passenger locomotives for service between New York and Washington. This is in addition to the former order for roller axle bearings for 28 electric locomotives now being built and two experimental locomotives. The present order will give a total of 165 locomotives of this carrier equipped with Timken bearings on all axles.

□ □ □

Bantam Ball Bearing Co., South Bend, Ind., has been awarded a contract for conical roller thrust bearings and aligning seats on the cylinder gate hoists for the four intake towers at Boulder dam, through the general contractor, Consolidated Steel Co., Los Angeles. These bearings are 14 inches inside diameter, 24½ inches outside diameter, 4 9/16 inches thick and have a load carrying capacity of 1,000,000 pounds at operating speed. Rollers and races are of high-carbon chromium through-hardening steel, heat treated by the company's special method.

□ □ □

Manitowoc Shipbuilding Corp., Manitowoc, Wis., is remodeling at cost of $250,000 to $300,000 a large suction dredge bought last summer from the city of Portland, Oreg., for the Great Lakes Dredge & Dock Co., Chicago. Its 1500-horsepower turbine will be replaced by a 5000-horsepower unit being built by the Bucyrus-Erie Co., South Milwaukee, Wis. Forbidden by NRA to build a new dredge the company purchased the idle dredge at Portland, towed it via Panama canal and the St. Lawrence river to the Great Lakes at cost of $15,000 to $20,000 for towing service. Only the steel hull will remain of the original 206-foot dredge.

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Werra Aluminum Foundry Co., Waukesha, Wis., has been placed in friendly receivership with a view of forming a new corporation to take over the assets and continue the business. Under the reorganization plan Conrad Werra, who founded the business in 1913, will retire as president, remaining in a consulting capacity as to metallurgical practice. Julius Werra will head the new company and Bruno Werra the production, research and metallurgical divisions. The new capitalization will consist of 2000 shares, par value $10, 7 per cent preferred stock and 5000 shares no par common stock. Financing will be done largely by Waukesha and Milwaukee interests.

Equipment

Pittsburgh—Additional bids on numerous subcontracts in connection with the Bethlehem Steel Co.'s Lackawanna, N. Y., continuous strip-sheet mill were being taken up through last week, indicating awards will be delayed somewhat beyond the originally Feb. 15 deadline. Among steel mill equipment work nearing a more promising stage is award for the new 48-inch blooming mill for Jones & Laughlin Steel Corp., a major part of a planned $4,000,000 expenditure by the company. Foreign steel mill equipment inquiry continues brisk with Russian, Japanese and Mexican inquiries promising. Wheeling Steel Corp. has placed orders for new checker brick work in stoves of a third blast furnace.

Chicago—Despite hesitancy recently in new business, the outlook for sales of major types of machinery and plant equipment remains favorable. Inquiries are holding well and an early increase in sales is anticipated provided the uncertainty engendered by the gold clause decision is removed. Demand for small tools finds little reflection from this situation and steadily is increasing as a result of expanding operations at metalworking plants. Machine tools on the recent inquiry of the Santa Fe railroad still are pending, with no new inquiries appearing from the carriers.

Washington—The ordnance bureau of the war department will receive bids on March 11, 12 and 13 for a list of machine tools amounting to about $600,000. This is the remaining balance of $2,309,000 which was given to ordnance by PWA for the purchase of various machine tools.

Construction and Enterprise

Ohio

COLUMBUS, O.—City is arranging additional fund for electric light and power plant development totaling about $1,100,000 for new generating plant unit, installation of 10,000-kilowatt turbo-generator and auxiliary equipment. Financing will be carried out through PWA which recently approved loan of $320,000 for part of the project.

DAYTON, O.—Office of contracting officer, material division air corps, Wright field, has postponed bids from Feb. 11 to Feb. 25, circular 433, for pump assemblies.

SPRINGFIELD, O.—According to E. B. McDonald, plant manager, Oliver Farm Equipment Co., an order to remove the equipment and operations of the Springfield plant to South Bend, Ind., and Battle Creek, Mich., has been rescinded and the plant will continue operations here. The foundry operations

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moved to South Bend sometime ago will be returned.

TORONTO, O.—Follansbee Bros. Co., third and Liberty streets, Pittsburgh, will resume operations at its plant here early in March, after necessary repairs have been made.

New England

SOUTH BOSTON, MASS.—D. W. Clark Brass Foundry, 529 East Seventh street, recently was slightly damaged by fire.

Indiana

JEFFERSONVILLE, IND.—Contracting officer, quartermaster corps, will take bids March 1, circular 65, on about 17 tons of black steel, flat sheets.

New York

AUBURN, N. Y.—City is proposing to arrange bond issue of $1,500,000 for new city-owned electric light and power plant. Burns & McDonnell Engineering Co., 107 West Linwood boulevard, Kansas City, Mo., consulting engineer.

ROCHESTER, N. Y.—Rochester Gas & Electric Co. plans to begin construction of a new $1,000,000 generating plant about April 1. The plant will be an addition to the company's present steam generating facilities.

ROCHESTER, N. Y.—Merchants' Despatch Inc., Mercantile building, car manufacturing subsidiary of New York Central railroad, has received orders for refrigerator cars amounting to $2,000,000, and will resume operations at its plant at East Rochester, N. Y., which has been idle since 1931.

Pennsylvania

GREENSBURG, PA. — Overmyer Mould Co. of Pennsylvania has been incorporated with $50,000 capital stock to manufacture molds, castings and machinery, by K. R. Haley, C. L. Mentch and M. Longnecker, Greensburg, Pa.

PHILADELPHIA—Philadelphia Electric Co., 1000 Chestnut street, has authorized fund of $8,800,000 for construction and improvements in 1935, including completion of addition to Richmond generating station, now under way, estimated to cost about $4,200,000.

PITTSBURGH—J. F. Edwards Mfg. Co., Pittsburgh, has been incorporated with $50,000 capital stock to manufacture, buy and sell mattresses and box springs. J. F. Edwards, 1317 Madison avenue, Pittsburgh, is one of the incorporators.

Michigan

DETROIT—Bendix Aviation Corp., South Bend, Ind., has acquired the Zenith-Detroit Corp., foot of Hart street, Detroit, manufacturer of carburetors. The name of the latter company has been changed to Zenith Carburetor Co.

DETROIT—Murray Corp. of America Inc., 1424 Aberle street, plans installation of heavy-duty motors and controls, electric hoists, conveyors in new addition to heavy metal stamping division works at Ecorse, Mich. Cost over $100,000.

HOUGHTON, MICH.—Cohodas-Paoli Co. Inc., whose office and warehouse was severely damaged by fire in January, is planning to rebuild a 3-story fireproof structure. The new establishment will be modern throughout, both in construction and equipment.

Illinois

CHICAGO—Commercial Metal Products Co., 2011 Wabansia avenue, has been incorporated to do metal spinning and stamping, by Abraham S. Zagel, Zelda S. Zagel and Samuel J. Zagel Jr.

CHICAGO—Cudahy Packing Co., 221 North LaSalle street, has acquired control of six packing plants operated by the Victoria Cold Storage Co. in Victoria, Edna, Goliad, Cuero, and Yorktown, Tex., and will probably enlarge facilities at these plants.

CHICAGO—Austin Co., 16112 Euclid avenue, Cleveland, has been awarded contract for a plant in the Chicago district to be built by the Electro-Motive Corp., subsidiary of General Motors Corp., General Motors building, Detroit, for building diesel and diesel-electric railroad locomotives. Construction of diesel engines will continue at the Winton Engine Cor;. plant in Cleveland, another General Motors subsidiary, but assembly of locomotives will be done in Chicago.

QUINCY, ILL.—Plant of the Quincy Foundry & Novelty Co. was damaged by fire which started in the molding room.

District of Columbia

WASHINGTON—Bureau of supplies and accounts, navy department, will take bids Feb. 26, schedule 4250, on 424 rough machined forgings, turret rollers and 424 turret rollers.

WASHINGTON—Bureau of supplies and accounts, navy department, will open bids Feb. 26, schedule 4276, arc welding machines and equipment, delivery Washington; schedule 4286, rough machined steel forgings, delivery Brooklyn, N. Y.; schedule 4296, one motor-driven surface grinder, delivery Philadelphia; schedule 4298, nine pedestal-type grinding machines, delivery Philadelphia.

WASHINGTON—Bureau of supplies and accounts, navy department, will take bids, Feb. 26, schedule 4305, two motor-driven universal milling machines, delivery Philadelphia; schedule 4325, steel boiler plates, delivery Brooklyn, N. Y., and Philadelphia; schedule 4338, one motor-driven centerless grinder, delivery Philadelphia; schedule 4340, one motor-driven two wheel spur and helical gear grinder machine, delivery Philadelphia; schedule 4341, one motor-driven surface grinder machine, delivery, Philadelphia; March 1, schedule 4320, steel tanks, delivery White Plains, Md.; March 5, schedule 4323, motor-driven low pressure air compressors, delivery Brooklyn, N. Y., and Philadelphia.

Florida

MIAMI, FLA.—Llewellyn Machinery Corp., is planning to rebuild its warehouse at Northeast Second avenue and Seventy-first street, recently damaged by fire.

Kentucky

CRYSTAL SPRINGS, KY.—Crystal Spring Distillery will erect an addition to its plant at a cost of $50,000, with equipment, Walter C. Wagner, architect, Breslin building, Louisville, Ky.

HARDINSBURG, KY.—Town will take bids Feb. 26 for constructing complete waterworks system, including filter equipment and tank and tower.

Louisiana

BATON ROUGE, LA.—Norman V. Riviere, architect, Thibodaux, La., is preparing plans for a 2-story bottling plant for the Baton Rouge Coca Cola Bottling Co., to cost $30,000.

SUNSET, LA.—Village, Joseph H. Castille clerk, will receive bids Feb. 26 for waterworks system.

Maryland

ANNAPOLIS, MD.—Annapolis Metropolitan Sewage commission, J. Garland Healy chairman, will receive bids March 5 for water supply system, consisting of furnishing well and deep well pump, and pressure-type storage tank.

OCEAN CITY, MD.—Ocean City chamber of commerce is interested in

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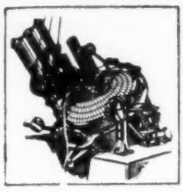

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enable two men to pour a car wheel *a minute*

"Speed, Safety and Economy of Curtis Crane and Hoist Equipment cuts Production time and costs"

The Griffin Wheel Company, with main offices in Chicago, operates 12 plants in the United States. Curtis Cranes and Air Hoists are used to open and close molds, to propel mold conveyors, and for handling and pouring molten metal, operations that require the utmost accuracy, speed and safety. Mr. E. P. Waud, operating Vice-President of the Griffin Wheel Company, writes*:

"At our 12 plants we use a large number of Curtis Cranes and Hoists. For instance, we have found that one Curtis Crane and Hoist, at a total cost of $1.75 per day, including power (or the equivalent to 1/3 the wages of one man) is making it possible for two men to pour 200 tons of metal a day—a job that formerly required a gang.

"Because of its light but sturdy construction, Curtis equipment is easy to handle and speeds up production. Curtis construction has always proved dependable, its factor of safety high—a very essential point in handling molten metal."

Perhaps Curtis equipment can show you the way to new speed and economy in your industry as it has done in other industries. Why not consult our Engineering Department on your problems?

*Production executives will find Mr. E. P. Waud's report of vital interest. Copy will be sent on request.

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CURTIS COMPRESSORS—AIR HOISTS—I-BEAM CRANES and TROLLEYS

construction of power plant; may issue $150,000 bonds.

SNOW HILL, MD.—Walter T. Onley, Girdtree, Md., is planning to erect a cannery near here. Raymond Nock, Lewes, Del., is plant superintendent.

North Carolina

CHARLOTTE, N. C.—Larkwood Silk Hosiery Mills Inc. will install motors, regulators, conveyors and other equipment in its new multi-story addition to knitting mill. Estimated cost $300,000.

MANTEO, N. C.—Roanoke Island Packing Co. is planning to establish a canning plant in the D. B. Fearing warehouse.

South Carolina

FORT MILL, S. C.—Town will apply for loan of $40,000 for power distributing system.

MULLINS, S. C.—Ralph Jones has established an iron foundry here.

Tennessee

KNOXVILLE, TENN.—City is considering new 50,000-gallon reservoir and an addition to filter plant, including installation of pumps. Will apply to PWA for loan of $1,750,000.

KNOXVILLE, TENN. — John W. Andes, 1717 Lake avenue, Knoxville, and W. J. Hargis, Cleveland, Tenn., have purchased plant and property of the Appalachian Flooring Co. and will manufacture oak flooring and pine and hardwood timber.

NASHVILLE, TENN.—United States Tobacco Co., 1107 Broadway, New York, plans installation of motors and controls, conveyors and other equipment in its new multi-story plant here, for which bids will soon be asked. Cost is estimated at approximately $200,000.

West Virginia

FOLLANSBEE, W. VA.—American Tar Co. has begun construction of a dock here, following completion of harbor dredging recently.

RACHEL, W. VA.—Bertha Coal Co., Chamber of Commerce building, Pittsburgh, plans installation of motors and controls, hoists, conveyors, loaders and other equipment in connection with rebuilding of coal tipple here.

Virginia

LYNCHBURG, VA. — Appalachian Electric Power Co., Roanoke, Va., has approved plans for new power substation on Fifteenth street here. Cost about $70,000. (Noted Dec. 10).

NORFOLK, VA.—Keeling-Easter Co. Inc. has permit for erecting corrugated iron building for a lime manufacturing plant, to cost about $16,000.

PETERSBURG, VA.—City, Henry Yancy city manager, has closed contract with Virginia Electric & Power Co. for installing improved street lighting system at a cost of $50,000.

SOUTH BOSTON, VA.—Golden Belt Mfg. Co. is making improvements to a portion of the building of the American Tobacco Co., and will install machinery.

Missouri

BLAND, MO.—City, D. S. Branson mayor, will soon call for new bids for complete waterworks and sewage disposal system, bids received Dec. 28 having been rejected. George E. Wells Inc., 420 Security building, is the engineer.

FORDLAND, MO.—Mountain Lake Distillery Co. Inc. has been formed by J. A. Kikkian, Marshfield, Mo., and Davis H. Hart, Seymour, Mo.

KANSAS CITY, MO.—Continental Can Co., 1400 Guinotte street, has acquired the plant of Janssen-Ostertag Mfg. Co. at Eighth and Mulberry streets.

KANSAS CITY, MO.—Standard Bag Co., organized by William F. Pickett and Tony Gillette to manufacture burlap containers, has leased space in a building at 700-04 Troost avenue and will install machinery.

ST. LOUIS—Union Distilleries Products Co. has been incorporated by John Brown and J. J. Lemen, Paul Brown building.

Arkansas

HARRISON, ARK.—City, Rex Worthington mayor, plans voting on $130,000 bonds for erecting light plant and distributing system.

MARSHALL, ARK. — City plans waterworks system to cost $48,000. R. E. Williams, engineer, Southern building, Little Rock, Ark.

MURFREESBORO, ARK.—City plans $43,000 waterworks, including elevated tank. F. A. Prichett, engineer, Wallace building, Little Rock, Ark.

Texas

ABERNATHY, TEX.—City will receive bids Feb. 26 for waterworks system, including 50,000-gallon capacity elevated tank. J. D. Norman is mayor.

COOPER, TEX.—City voted issuance of $104,000 bonds for erecting light plant.

GEORGETOWN, TEX. — Standard Tool Machine Co. has been incorporated with capital of $15,000, by W. B. Johnson and J. O. Lyle.

GEORGETOWN, TEX.—Georgetown Oil Mills Inc. is planning installation of motors, controls, loaders, conveyors and other equipment in connection with rebuilding of cottonseed oil mill recently damaged by fire.

GOOSE CREEK, TEX.—City, C. R. Myers mayor, will submit to Texas planning commission a public works program involving $536,000, including $300,000 for light and power plant.

KILGORE, TEX.—East Texas Tool & Supply Co. has been incorporated with $25,000 capital, by Tom Potter and W. H. Sanders.

Wisconsin

DELAVAN, WIS.—Sta-Rite Products Inc., W. H. Hazard president, expects to begin manufacturing March 1 of a new line of shallow well and deep well pumps with electric motor or gas engine drive, in the new factory built for it by the Delavan chamber of commerce.

EAU CLAIRE, WIS.—Walter Brewing Co. has let contracts for a 4-story addition, 25 x 55 feet, to its stock house, and a 2-story extension, 25 x 40 feet, to its wash house.

KENOSHA, WIS.—American Brass Co. factory recently was slightly damaged by fire.

LODI, WIS.—City has applied for permission to build an electric light and power plant, using diesel engine-generating units.

MILWAUKEE—First step in the building program announced two weeks ago by the Wesley Steel Treating Co. 1231-1341 West Pierce street, will be construction of an addition to its No. 2 plant. The new unit will house a continuous pusher furnace. (Noted Feb. 4).

Iowa

MACEDONIA, IOWA—Iowa-Nebraska Light & Power Co., Lincoln, Nebr., is considering extensions and improvements in electrical distribution system here. Cost reported close to $50,000.

Kansas

BURLINGTON, KANS.—City will soon take bids for municipal electric light and power plant. Fund of $145,000 is being arranged. E. T. Archer & Co., New England building, Kansas City, Mo., consulting engineers.

Colorado

DENVER—Bureau of reclamation will take bids Feb. 25, specification 663-D, for one 10-inch lathe, one 24-inch upright drill press and one 10-inch pedestal grinder for the Boulder canyon project.

DENVER—Reclamation bureau will open bids Feb. 26 for furnishing a 75-ton gantry crane and a 15-ton auxiliary hoist for installation at the storage yard, Grand Coulee, Wash.

GRAND JUNCTION, COLO.—Blair Burwell, general superintendent, United States Vanadium Corp., states that the company may erect a mill at Paradise, Colo., when business conditions justify.

Pacific Coast

ANTIOCH, CALIF.—Western California Canners is building a new warehouse here at a cost of $7500, and is installing new machinery at a cost of $25,000.

BAKERSFIELD, CALIF.—Bakersfield Brewing Co. is planning construction of plant to cost close to $100,000, with equipment.

CALIFORNIA CITY, CALIF.—John A. Roebling's Sons Co., Trenton, N. J., is considering installing heavy-duty motors and controls, electric hoists, conveyors in its new steel cable plant here. Estimated cost $200,000.

NORWALK, CALIF.—Wilshire Oil Co., 2455 East Twenty-seventh and Vernon street, Los Angeles, is receiving bids for construction of an oil refinery here, which is estimated to cost $1,000,000.

STOCKTON, CALIF.—Stockton Grain Terminal association is preparing to build a galvanized iron addition to its plant here, to cost $110,000. Eugene D. Wilkinson is president.

STOCKTON, CALIF. — Bear Creek Vineyard association, Bear Creek, Calif., near here, is planning to build an addition to its plant to cost $70,000. Improvements will consist of new distillery, warehouse and cellar.

PORTLAND, OREG.—United States engineer has called bids for March 8 for furnishing two diesel generators for a 117-foot survey vessel.

Dominion of Canada

VANCOUVER, B. C. — Western Bridge Co., First and Columbia streets, Col. Victor N. Spencer president, is planning to rehabilitate and modernize its plant at a cost of about $335,000. Facilities will include fabrication, machine shop and equipment for manufacturing mining and other machinery.

TORONTO, ONT.—Dominion Foundries & Steel Ltd., Hamilton, Ont., will erect an addition to its plant here, to cost $15,000.

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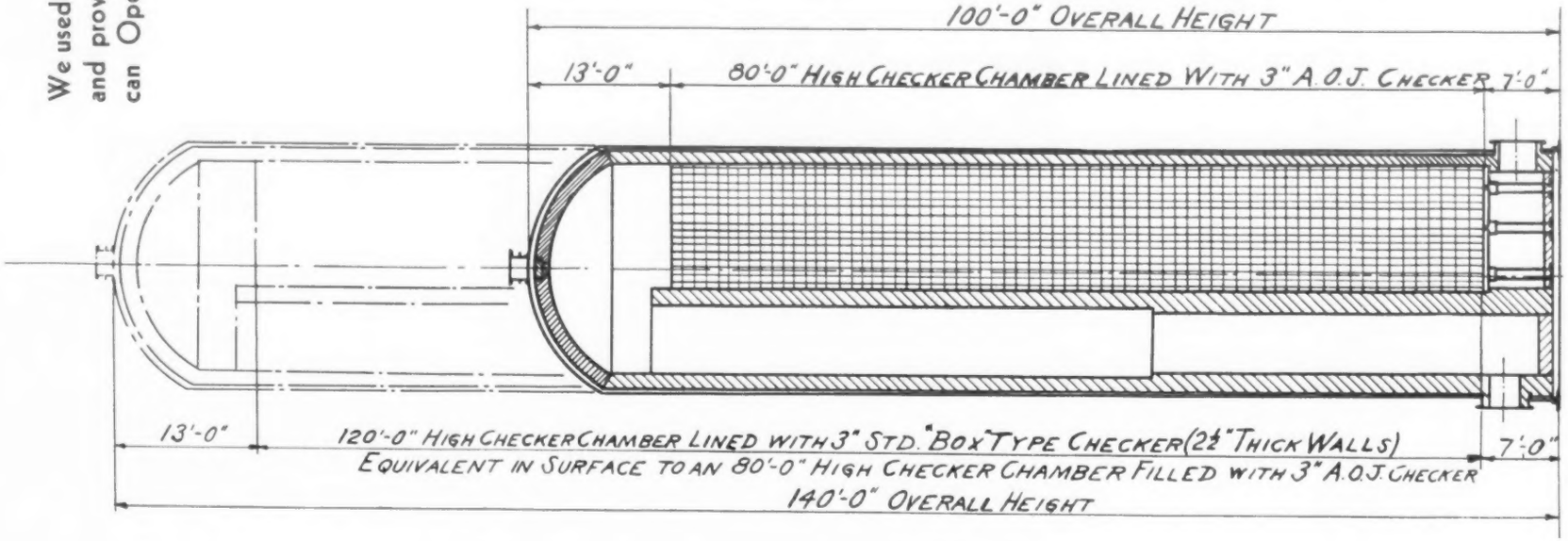
Heating Surface in Checker Chamber Only For Different Stove Shell Diameters:-

21'-0" Dia. Stove 112600 Sq. Ft.	Suitable for Primary Cleaned Gas (.10 to .25 grains/cu ft.) Free Area of "Top" Checker Flue 10.15 sq in.
22'-0" Dia. Stove 124650 Sq. Ft.	
24'-0" Dia. Stove 151300 Sq. Ft.	

The 3" A.O.J. Checker Lining is Based on 25 Ft. Height of "Top" Checker and 55 Ft. of "Straight" Checkers.

The "Box Type" Checker Lining Has 3" Sq. Flues with 2½" Thick Brick All the Way Up.-Minimum Dia. of Combustion Chamber is 5'-6" Dia. for the 21'-0" and 22'-0" Stoves, and 6'-0" for the 24'-0" Stove


100'-0" Overall Height
13'-0"
80'-0" High Checker Chamber Lined With 3" A.O.J. Checker
7'-0"
13'-0"
120'-0" High Checker Chamber Lined with 3" Std. "Box" Type Checker (2½" Thick Walls)
7'-0"
Equivalent in Surface to an 80'-0" High Checker Chamber Filled with 3" A.O.J. Checker
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The Bailey Company Offers the Following Data on Their 3" Open Joint Checker. Due to the Proper Weight Distribution and the Cross-Circulation a Checker Chamber Constructed With Open Joint Checkers is 30% More Efficient Than the Equivalent Heating Surface Using the Same Size Flue But Without Effective Cross-Circulation.

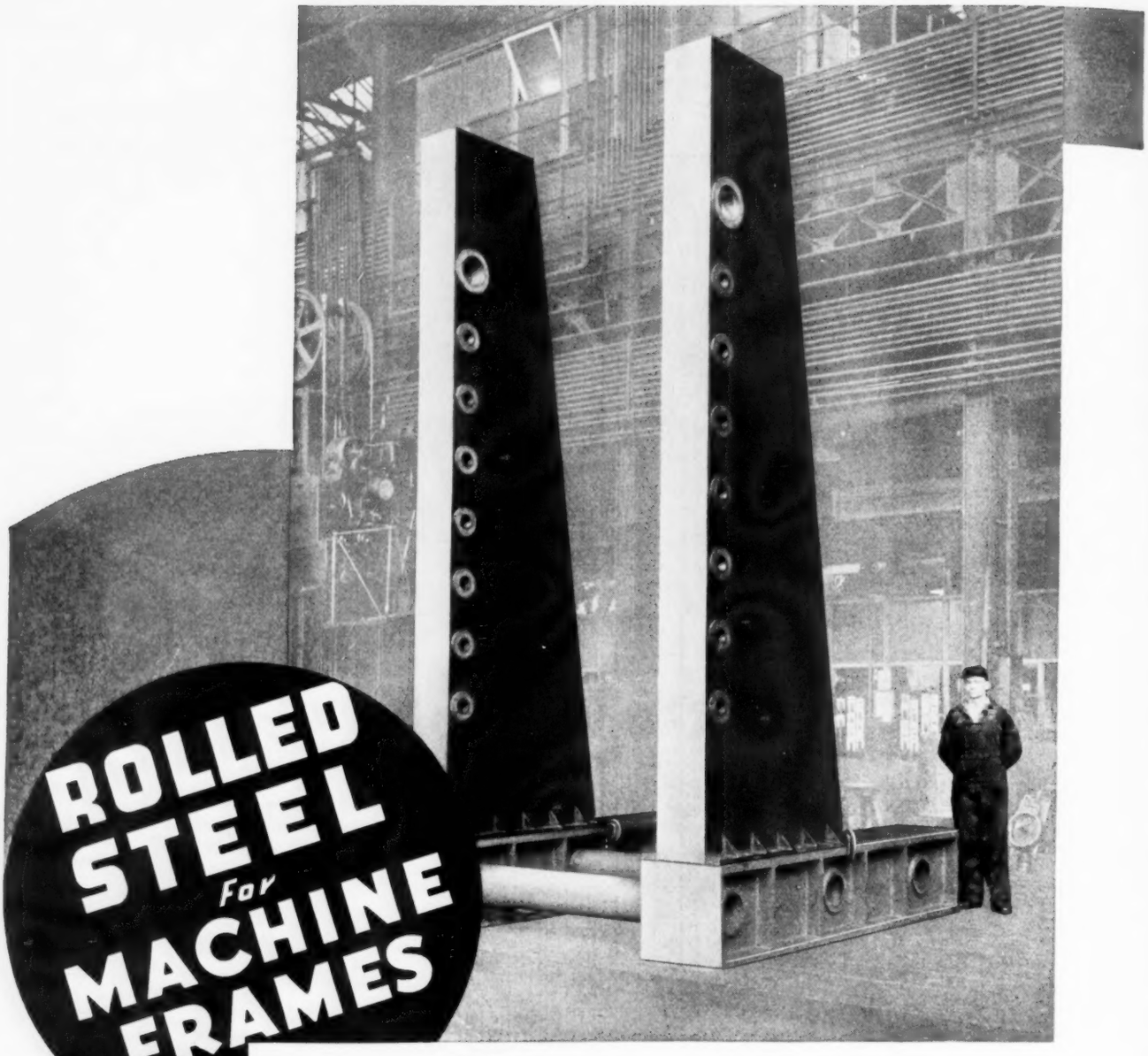
Heating Surface Using 2¾" Checkers (Free Area of Top Checker Flue 8.67 Sq In.)

21'-0" Dia. Stove 120700 Sq. Ft.	Suitable for Secondary Cleaned Gas (.10 Grains/cu. ft. or Better.)
22'-0" Dia. Stove 133500 Sq. Ft.	
24'-0" Dia. Stove 162200 Sq. Ft.	

Ribbed Checker:

For Secondary Cleaned Gas, .05 or Better, the Ribbed Checker May Be Used in Lower Section of Stove, Thereby Increasing Gas Burning Capacity Without Sacrificing Efficiency; in Other Words, the Quantity of Heat Absorbed by Stove Per Hour Is Increased.

Comparison Between 3" A.O.J. Straight Flue Checker Lining and 3" Sq. Flue "Box Type"	
William M. Bailey Company Pittsburgh, Pa	
Scale: None	SB - 214
Date: Feb. 6, 1935	



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4. Faster production . . . particularly of new and unstandardized parts.
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